THE GAS JOURNAL

JULY 20, 1932

Vol. 199 84th Year No. 3609

A Glance at the Contents—

Corporation Gas Undertaking Results.

Further results of Corporation Gas Undertakings for the year ended March 31 last are published. [p. 160.]

Co-Ordinated Heat Conservation.

Mr. W. J. Brooke, General Manager of the Normanby Park Works of Messrs. John Lysaght, Ltd., deals with this question as applied to the new battery of coke ovens. [p. 146.]

New Becker Coke Oven Plant at Normanby Park.

The battery of 47 coke ovens of Becker design, at the Normanby Park Works of Messrs. John Lysaght, Ltd., which was constructed by the Woodall-Duckham Company, is described in detail on p. 149.

Inspection and Insurance of Gasholders.

The 1st Report of the Gasholder Sub-Committee to the Council of the Institution of Gas Engineers, dealing with the Inspection and Insurance of Gasholders, has been published by the Institution. [p. 138.]

Illumination in Industry.

Mr. W. J. Jones, M.Sc., A.M.I.E.E., Manager of the Lighting Service Bureau, read a paper on this subject before the Annual Congress of the Royal Sanitary Institute at Brighton on July 12. [p. 158.]

Rental Superintendent Required.

As will be seen from our advertisement columns, a Superintendent is required by the South Metropolitan Gas Company to control the work of a department dealing with over 400,000 accounts monthly. The salary will be not less than £1000 per annum. [p. 164.]

National Gas Council.

A meeting of the Central Executive Board of the National Gas Council was held at 28, Grosvenor Gardens, S.W. 1, on Tuesday, July 12. [p. 148.]

Canadian Gas Association Convention.

Reference to the highly successful 25th Anniversary Convention of the Canadian Gas Association, held at Winnipeg under the presidency of Mr. Hugh McNair, is made on p. 143.

Gas Banned at London Colney.

The petition signed by twenty residents of Birkfield Cottages, London Colney, requesting that gas cookers be installed in their Council houses instead of electric cookers, has been rejected by the St. Albans Rural Council. [p. 145.]

Holding-Down Bolts of Disc-Type Gasholders.

In our Correspondence columns to-day, Mr. S. M. Milbourne, A.M.I.Struct.E., questions the accuracy of Mr. A. Gadd's formulæ in his article on "Holding-Down Bolts of Disc-Type Gasholders," which appeared in the "JOURNAL" on June 29 last. [p. 141.]

The Step System of Gas Charging.

Mr. R. Willacy, Secretary and Accountant to the Stockport Gas Department, explains the step system of gas charging in force at Stockport—a system which has stood the test for eight years and is claimed to be simple, equitable, and easily understood. [p. 154.]

Electricity and Gas for Domestic Use.

The relative advantages of electricity and gas for domestic use were advanced at the Annual Meeting of the Royal Sanitary Institute by Mr. W. N. C. Clinch, Engineer and Manager of the Brighton Electricity Department, and Mr. P. E. Browne, Distributing Engineer to the Brighton, Hove, and Worthing Gas Company. [p. 155.]

Forthcoming Engagements

July 21.—S.B.G.I. Council Meeting.
July 22.—GAS COMPANIES' PROTECTION ASSOCIATION.—Committee Meeting at 5, Victoria Street, S.W. 1.
July 26.—INSTITUTION OF GAS ENGINEERS.—Meeting of General Research Committee, 2.30 p.m.; 28, Grosvenor Gardens, S.W. 1.
July 27.—INSTITUTION OF GAS ENGINEERS.—Meeting of Joint Lighting Committee, 11 a.m.; 28, Grosvenor Gardens, S.W. 1.
July 27.—SOUTHERN ASSOCIATION (EASTERN DISTRICT).—Meeting at 28, Grosvenor Gardens, S.W. 1, 2.30 p.m.
Aug. 16 and 17.—IRISH ASSOCIATION.—Meeting in Dublin.
Sept. 1.—ASSOCIATION OF STATUTORY METER INSPECTORS.—Annual Meeting in Edinburgh.
Sept. 8.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual Meeting in Ayr.
Sept. 13.—NATIONAL GAS COUNCIL.—Meeting of Central Executive Board. There will be no meeting of the Board or of the Central Committee of the Federation of Gas Employers during August.
Sept. 22.—WALES AND MONMOUTHSHIRE ASSOCIATION.—Meeting at Porthcawl.
Sept. 26 to 28.—B.C.G.A.—Annual Conference at Leeds.

EDITORIAL NOTES

Co-ordinated Heat Conservation

LAST week we had the interesting experience of inspecting a remarkable piece of engineering and fuel technology at the Normanby Park Works of Messrs. John Lysaght, Ltd.—an installation of modern coke ovens, blast furnaces, and steel plant which, by an excellently planned scheme of co-ordination, conserves fuel and by increased efficiency throughout lowers the cost of production of the finished steel. In this plant, the first of its kind in this country, the only coal necessary for the entire work is that charged into the coke ovens, it being now possible to convert all the iron manufactured into steel, and roll it in the mills, without the use of any extra solid fuel. One ton of steel, including the pig iron for its manufacture, can be produced and rolled by the use of approximately 30 cwt. of coal. The principles of the scheme and details of the plant are dealt with in articles in this issue of the "JOURNAL," and there will, we think, be unanimity of opinion that the whole plant represents a marked advance in the science and practice of fuel utilization. The General Manager of the Works, Mr. W. J. Brooke, who took charge of the party on the occasion of our visit, has put his whole heart into the scheme, as have also the Chief Engineer, Mr. F. H. B. Gough, and his Assistants.

The idea underlying the scheme is based on the fact that the low iron content of the local ores necessitates the use of a large quantity of coke in the manufacture of pig iron, and provided the coke thus required is made in a plant in close proximity to the blast furnaces, the gas from the coke in the blast furnaces and the rich gas from the coke ovens can be together or separately utilized for all the heat requirements in the making and the rolling of the steel made from the pig iron. For the first time in this country the coke ovens are heated by blast furnace gas, the ovens being of the Becker design; and the coke produced is of such strength, uniformity of size, and combustibility that the whole of the production down to ¾ in. in size can be used in the blast furnaces, and yet less coke is required per ton of pig iron produced. In this manner the blast furnace gas is used to the greatest advantage, and all the gas made in the ovens is released for use in the steel-works. The coke oven gas is giving better efficiency in the steel-works than is obtained by any other form of fuel; and so nice a balance is attained between the total heat produced and that used in the various departments of the works that, as stated, it is merely a question of charging coal into the ovens. Already the reduction in cost of production effected has more than justified the capital expenditure involved; and the scheme as carried out demonstrates how money wisely spent can contribute largely to the recovery of prosperity in perhaps the most important of the country's industries.

The entire bye-product coking installation, which is more particularly of interest to our readers, was designed, erected, and put into operation by the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd.; and it is a very fine job indeed, as will be gathered from our illustrated description on later pages. The Becker ovens have a carbonizing capacity of 1020 tons of coal per 24 hours, equivalent to a coke production of 670 tons; and the blast furnace gas is delivered to the plant with a dust content of less than 0·003 grain per c.ft. To obtain the fullest control over the supply and use of the blast furnace gas, the whole of this system is controlled by a 2 million "M.A.N." waterless holder, installed by Messrs. Clayton, Son, & Co., Ltd. This is connected in parallel with the blast furnace gas system and maintains a uniform pressure throughout. To safeguard the battery in the event of failure of the blast furnace gas supply, electrical control gear is provided so that when the gas pressure falls the reversing machine is automatically put into a neutral position and an audible warning given. Indeed, one of the features of the plant as a whole is the provision of safety devices. All the various departments are interlinked, and indicators are installed at all points where gas is being used, whereby the men in charge may have full knowledge of the position of the gas supply at both the coke ovens and the blast furnaces at any moment. There are many points of detail which will appeal to our readers, and it will be noted that electrical tar precipitators are incorporated in the plant. Altogether the Normanby Park installation is a joy to the engineer and the fuel technologist.

Committee on Local Expenditure

MOST people must have fully realized by this time that public expenditure has attained levels that cannot be maintained. This is what the Monthly Review of Barclay's Bank has to say about the inflated levels to which post-war expenditure has been raised: "During the ten years ended March, 1930, the average annual amount received by the local authorities in England and Wales from rates and Government grants alone was £147,000,000 more than in 1913-14—a total increase in the ten years of £1,470,000,000. In the same period these authorities also spent as much as £663,000,000 net of borrowed money, and the magnitude of the increase in the expenditure represented by these figures is shown by the fact that together they amount to nearly £50,000,000 more than the total of the 5 p.ct. War Loan outstanding in March last."

In these circumstances there has been considerable satisfaction with the attitude of the Chancellor of the Exchequer in asking local authorities to set up a Special Expenditure Economy Committee. Ratepayers in general will eagerly anticipate the outcome, though it is possible that some disappointment may have been felt that the membership has been confined to representatives of local authorities and their associations. Such disappointment has, in fact, been voiced by the National Federation of Property Owners and Ratepayers of England and the National Federation of Property Owners and Factors of Scotland, who have passed a resolution expressing regret that "it is proposed that the new Committee should be composed entirely of representatives of local authorities and officials who are themselves responsible for the existing state of extravagance," and "urging the National Government to appoint a Committee which includes members who are neither elected representatives nor officials of any local authority." There is ground for maintaining that a review of local expenditure is insufficient to meet the case in which the country finds itself, but it will be a beginning, and with fuller information before them the Government should be able to take their own steps to check that dangerous game which used to be known as "outrunning the constable."

"Be Prepared"

BUT though there are urgent calls for drastic schemes of economy on the part of bodies responsible for the spending of public money, it is essential that the matter should be clearly understood; and unfortunately both correspondence and conversation go to show that this clear understanding is as yet far indeed from being universal. To be of use, economy must be real, and there are any number of cases in which the saving of money may be the greatest possible extravagance. The economy of which the country stands in such dire need will not be served by aiming at anything less than the highest efficiency in connection with productive services.

This is a point which we have already stressed in the "JOURNAL," but it is opportune now to reiterate the warning that if the Gas Industry is not ready "to the last button" when the call comes, any so-called "economy" which may have been achieved by this unreadiness will have been dearly bought indeed.

In some instances effectual "making ready" to take advantage of the greater opportunities which will certainly be presented to the Industry when better times arrive must involve modernization of plant, while in others extensions of plant will be necessary. But whatever the requirements, it is unlikely that a better opportunity than the present, so far as costs are concerned, will occur—or even that the level of prices now in existence will prevail for very long—and thus there is nothing from this point of view to be urged in favour of a waiting policy. Manufacturers, too, are in a position to give prompt attention to orders; so that, again, there is nothing to advance in favour of delay on this score.

"Economy" of the kind above referred to is not what those in authority desire. What they are after, and what we all wish to see, is a stupendous reduction in the public funds expended by the local authorities, and not the adoption of a "penny wise" policy in connection with reproductive municipal undertakings. Cheap gas is of great importance to-day; it will be vastly more important when trade revives. Our injunction, therefore, to gas administrators—and this, of course, applies equally to company as to the local authority owned undertakings, though it is the latter that we are discussing at the moment—is: "Be prepared." This preparation will be complete only when all practicable steps have been taken to furnish an adequate supply of gas at the lowest possible price. An answer given to a question just before the House rose, by the Parliamentary Secretary to the Board of Trade, indicated that the Government assume that, as a matter of course, such steps will be taken.

Gasholder Inspection and Maintenance

THERE will be found following the Editorial Notes in this issue of the "JOURNAL" the first report of the Gasholder Sub-Committee (signed by the Chairman, Mr. Thomas Hardie) to the Council of the Institution of Gas Engineers. As it will be carefully studied by readers, there is no need to enlarge upon the report here. Attention is drawn to the necessity of differentiating between the inspection of gasholders and their insurance. On the first point, the Gasholder Sub-Committee are of opinion that undertakings should continue to be responsible for the inspection of their holders by their own staffs; while on the latter they say that the insurance of holders under inspection and insurance schemes referred to by them does not appear to be generally necessary, having in mind the extreme remoteness of the "risk."

Really, Mr. Clinch!

A QUITE ridiculous paper on the relative advantages of electricity and gas for domestic use was read by Mr. W. N. C. Clinch, Engineer and Manager of the Brighton Corporation Electricity Department, before the Royal Sanitary Institute last week. It is a pseudo-scientific contribution which can do good neither to the author nor to the great public utility he serves. In the year 1932 it is out of place for a man to hurl comic thunderbolts which have for so long been relegated to the pantomime scrapheap. The Gas Industry's positive advertising, so admirably carried into effect by the B.C.G.A.—advertising which is content to put forward the advantages of gas—has undoubtedly earned the goodwill of the general public, has enhanced the prestige of the Industry and its powers of service, and has permeated the personnel of the Industry. It is in marked contrast to the system followed by Mr. Clinch, which is hardly indicative of strength.

Old tags and old snags are paraded cheerfully; the paper might, indeed, have been written at the close of the last century. The author objects strongly to flame, to products of combustion, and to the fact (?) that "the walls and furnishings retain the flocculent carbonaceous solids continuously ejected from the gas oven while in operation—a most unhealthy condition." It disturbs us to think that over nine million homes in Great Britain are continuously retaining flocculent carbonaceous solids; this cannot be a sign of intelligence in days of higher and still higher education. And all this "contamination of product of combustion" business, "which must always be present with gas"—old bogeys, it would seem, unlike soldiers, neither die nor fade away. We learn with horror that the lighting of a gas oven "is still a somewhat dangerous undertaking," and feel due remorse that "gas cannot compete with the hygienic and sanitary methods now demanded and made available by the use of electricity." The whole point, we gather, is that electricity is "pure heat," whatever that may mean, and that therein lies its virtue; and as for competitive arguments about cost, these are readily discounted in practice. We wonder.

However, "the effect of evolution is leaving its mark," and Mr. Clinch asks us to "consider the ludicrous situation of a skilled mechanic working to close limits of accuracy by the aid of a gas light in close proximity to his work." What does he mean; is the mechanic bending down, or standing on his head? But there is worse to follow. Electricity as a source of heat does not reduce the oxygen content of the air in the room, and "the ventilation of the room, for the normal purposes of the occupants, can be arranged without inducing a draught across the room to the fireplace, as must occur with a gas fire." Here is a little fable: Once upon a time a bold inventor introduced the electric fan; but he could not sell even one model in Great Britain, because the inhabitants loved stagnant, still air conditions.

No, Mr. Clinch, it really will not do.

Nor can the remarks of Mr. A. E. McKenzie in the discussion be taken without a few tons of salt. He spoke about the poisonous bye-products "which it is well known cause the headaches and lassitude inseparable from gas cooking," and he painted a lurid picture of innocent and happy children, playing in a kitchen, inhaling poisonous carbon monoxide fumes. It is all very silly.

Safety and Economy

IN marked contrast to the contribution by Mr. Clinch is the congress paper on illumination in industry by Mr. W. J. Jones, Manager of the Lighting Service Bureau. There still exists a tendency on the part of most industrial executives to consider lighting as an expense which should be borne grudgingly. Yet it can readily be demonstrated that good lighting not only promotes the welfare of the employee but puts money into the pockets of the employer. There is ample evidence, for example, that good lighting increases the output of work and is an important factor in maintaining quality. From time to time we have published in the "JOURNAL" reports of official, carefully controlled, tests in such work as type-setting and weaving, indicating to what a remarkable extent the high standard of lighting has an economic value through improved production. Mr. Jones cites the results of two investigations into the lighting conditions of a foundry and a tile-making factory. The operatives of the foundry were able to earn a substantial bonus as the result of improved lighting, and by the better illumination of the tile-making factory production was increased by 6 p.ct. And it must be borne in mind that in most factories the cost of lighting represents less than 1 p.ct. of the wages bill, and, therefore, that the value of a very small increase in output brought about by better lighting will amply meet any additional lighting costs.

As an example of this it has been estimated that by increasing the illumination from 2 to 20 ft.-candles the output in a type-setting establishment was increased by one-third—sufficient to meet the cost of the extra lighting some twenty times over.

We thoroughly endorse the suggestion of Mr. Jones that every opportunity should be taken by all engaged in hygiene and sanitation of stressing the importance of in-

dustrial lighting in its effect on industrial hygiene; and a corollary to this is that a knowledge of artificial lighting is essential to anyone engaged in health work. A special study of the subject might well be included in the curriculum of medical officers of health and welfare workers. A useful table of recommended illumination values for industrial purposes is included in the paper, which should prove a valuable guide to the Gas Industry; and the remarks of Mr. Jones on the question of maintenance of lighting output from existing installations should be borne in mind. It has been found, for instance, that dirt and dust are frequently responsible for a loss of 40 p.ct. of the light emitted by lamps. And it would certainly be a paying proposition for factories of any size to make use of a portable photometer to check prevailing conditions.

The paper by Mr. Jones appeals to us very strongly because of its non-controversial nature—a fact which greatly enhances its value and general application. After all, gas and electricity are both excellent lighting agents, and both industries have done good work in developing the technique of illumination. For a long time now the Gas Industry has realized that good lighting means safety and saving in the factory, and in common with the electrical industry has aimed at a high standard of lighting in factories and workshops. Where gas undertakings have installed modern and efficient lighting there has been thorough satisfaction with the results; and it is a great pity that gas lighting is often judged by some of the obsolete installations which, unfortunately, still exist. In considering the comfort conditions and methods of heating in factories the special claims of gas lighting ought not to be overlooked. Particularly important is the heat radiated from the gas mantle—a matter of some 30 p.ct. of the thermal energy supplied to the burner, provided there is no interference from a shade. This increment of heat can be a very useful factor in promoting factory economy, for in normal conditions very little artificial lighting is needed in a factory during the summer months, so that trouble from excessive heating does not arise. And even if artificial lighting were necessary, the heat from gas could easily be diminished by appropriate shades cutting off direct radiation. In the winter, when both lighting and heating are required, shades having an open base should be used, and the burner may often be kept alight with advantage during the daytime as a heating agent. There can be no question that this advantage of gas lighting both for industrial and domestic purposes has been greatly overlooked in the past. There are many instances on record where the installation of up-to-date gaslighting has resulted in a saving of 25 to 50 p.ct. in the fuel bill.

INSPECTION AND INSURANCE OF GASHOLDERS

REPORT OF THE GASHOLDER SUB-COMMITTEE TO THE COUNCIL OF THE INSTITUTION OF GAS ENGINEERS

1. In the 1929 Report of H.M. Chief Inspector of Factories, attention was drawn to the need for the proper inspection of Gasholders and—after full consideration of the subject and consultation with the Home Office—the Council of The Institution of Gas Engineers, on the recommendation of its Gasholder Sub-Committee, issued on 31st October, 1930, a letter in the following terms to its members and others interested, emphasizing the necessity for the adequate inspection and maintenance of Gasholders and the keeping of a systematic record thereof:—

> " The attention of the Council of The Institution of Gas Engineers has been drawn to certain accidents to Gasholders and to the inspection by the Factory Department of the Home Office of certain Gasholders in different parts of the country. It has been suggested that the Council should emphasize the necessity for the adequate periodical inspection of Gasholders, which are prominent pieces of apparatus and liable to attract public attention.
>
> " The Council has no reason to believe that Gasholders are generally maintained any less efficiently than other plant in Gas-Works, or that there is any substantial failure to recognize that all Gasholders should be systematically and carefully examined at regular intervals, in order to check the levels of tanks and lifts and to detect and remedy, inter alia, any corrosion of sheets, sections and bolts, fractures in cast iron and defects in guide carriages and rails.
>
> " Whilst it is difficult to specify fully the details of the examination necessary, or lay down effective rules for the maintenance of Gasholders in general, owing to variations in their situation, construction, and usage, it is considered desirable that a systematic record should be kept of the date, nature, and result of the inspections made and the work carried out on each holder.
>
> " The Council feels confident that co-operation in this matter on the part of members of The Institution of Gas Engineers and those responsible for the administration of Gas Undertakings, would obviate further consideration of the tentative suggestion that the inspection and maintenance of Gasholders should be subject to Governmental regulation."

2. Factory Inspectors throughout the country have become increasingly active in inspecting Gasholders, and Undertakings are being requested to produce the records which they keep. The Home Office has no special authority in this connection, except to apply for the certification of a Gasholder as a dangerous structure. Reports have been received from Undertakings indicating the procedure for Inspection already observed and/or the measures which had been or would be adopted to give effect to the recommendations of the Institution.

3. (*a*) In June, 1931, an Insurance Company promoted a Scheme to provide not only for Insurance against damage arising from Gasholder accidents—which risk was already largely covered by the existing " Fire " and " Third Party " Policies of Undertakings—but for the carrying out of an Initial and an Annual Inspection of the Gasholders insured. Similar Schemes for the Inspection and Insurance of Gasholders were afterwards promulgated by other Insurance Companies.

   (*b*) The Gasholder Sub-Committee collected and collated information relative to these Schemes and at its meeting on 10th November, 1931, it was resolved to advise the Council of The Institution of Gas Engineers to recommend where local conditions and circumstances make it advantageous for Gas Undertakings to provide by contract for the Inspection and Insurance of Gasholders, that such Inspection and Insurance should conform with Model Conditions approved and issued by the Institution.

   (*c*) At further meetings of the Gasholder Sub-Committee on 21st March and 5th and 25th April, 1932, developments were reported and information was received as to the further inquiries made on its behalf. The whole subject was fully considered, and it was resolved further to advise the Council in accordance with the terms of this Report.

4. (*a*) *The Gasholder Sub-Committee is of opinion that Undertakings should continue to be responsible for the Inspection of their Gasholders by their own Staffs* and if and when an inspection by a third party appeared desirable, such Inspection should be arranged

for by the Undertaking as is generally done for other Plant.

(*b*) To facilitate the Inspection of Water-Sealed Gasholders by the Staffs of Undertakings, the Sub-Committee recommends that such Inspection should be carried out and recorded—*mutatis mutandis*—in accordance with the "Periodical Gasholder Inspection and Maintenance Record" and the "Annual Gasholder Inspection and Maintenance Record," appended to this Report (Appendices I and II).

(*c*) *The Insurance of Gasholders under the Inspection and Insurance Schemes aforesaid does not appear to be generally necessary, having in mind the extreme remoteness of the "risk."* Where, however, local conditions and circumstances make it advantageous for Gas Undertakings to provide by such contracts for the Inspection and Insurance of their Gasholders, regard should be had to the considerations enumerated in the "Memorandum on the Insurance of Gasholders" appended to this Report (Appendix III).

(*d*) It is deemed inopportune to publish Model Conditions for inclusion in Policies for the Insurance of Gasholders, until adequate experience of the Schemes for such Insurance has been obtained.

(*e*) It is not considered desirable to recommend the Council to give official recognition to the Policy of any one Insurance Company, believing it to be in the best interests of Undertakings that Companies should be free to compete for this class of business and for Undertakings not to be restricted in their choice of Companies.

5. (*a*) It is necessary to differentiate between the Inspection of Gasholders and their Insurance. Insurance as such would not ensure the safety of Gasholders; it would merely operate to transfer a financial liability from an Undertaking to an Insurance Company. The Institution of Gas Engineers has urged and will continue to urge the necessity for the adequate Inspection and Maintenance of Gasholders. The Home Office is similarly concerned, but there is no information, direct or indirect, that that Department attached importance to the Insurance of Gasholders.

(*b*) If a Scheme for Inspection cum Insurance is in fact attractive in certain cases by reason of the Annual Inspection provided, it should be remembered that such a Scheme does not remove the necessity for frequent Inspection and Maintenance by the Undertaking itself and that advantageous arrangements for the Annual Inspection could probably be made with a third party if and when required, without the necessity for entering into a Policy of Insurance.

THOMAS HARDIE,
Chairman,
Gasholder Sub-Committee.

25th April, 1932.

APPROVED BY THE COUNCIL,

J. HERBERT CANNING,
President,
The Institution of Gas Engineers.

J. R. W. ALEXANDER,
Secretary,
The Institution of Gas Engineers.

28, Grosvenor Gardens,
London, S.W. 1,
10th May, 1932.

APPENDIX I.

PERIODICAL GASHOLDER INSPECTION AND MAINTENANCE RECORD.

Name of Undertaking:
Gasholder No.:
Situation:
Date of Inspection:
Inspection made by:

---

1. DAILY:
   General condition and Parts requiring attention.
2. WEEKLY:
   (*a*) Adequacy of Water in Cups and Tank.
   (*b*) Condition of Water-Overflow from Tank.
8. QUARTERLY:
   (*a*) Condition (especially as to corrosion, leakage, and paintwork) of:—
      i. Crown sheets.
      ii. Side Sheets (especially at "wind and water" line in Cups).
      iii. Cups, Grips, and Curbs.
      iv. Anti-Freezers.
      v. Seating of Guide Carriages.
      vi. Guide Rails.
      vii. Guide Framing.
   (*b*) Condition (especially as to tightness and greasing) of Rollers and Pins.
   (*c*) Levels* of:—i. Top Cup and Grip.
      ii. Second Cup and Grip.
      iii. Third Cup and Grip.
      iv. Tank Coping.
   (*d*) Repairs and Paintwork carried out since last Quarterly Inspection.
   (*e*) General.

NOTES:
* These Levels can readily be ascertained by checking the water levels at the N., S., E., and W. points.

APPENDIX II.

ANNUAL GASHOLDER INSPECTION AND MAINTENANCE RECORD.

Name of Undertaking:
Gasholder Number:
Situation:
Built in: by:
Type (*i.e.*, Column, Spiral or Rope Guided):
Capacity:
Lifts—Diameter and Depth of, and Pressure thrown by, each Lift:
Guide Framing—Construction:
Crown—Rise:
Sheets—Thickness of Crown Sheets:
—Thickness of Side Sheets:
Cups and Grips—Size and Construction:
Top Curb and Crown Framing—Construction:
Material used for Construction of—
(*a*) Gasholder:
(*b*) Tank:

Date of Inspection:
Inspection made by:

---

1. FRAMING:
   Condition of:—
   (*a*) Columns or standards and guide rails.
   (*b*) Girders.
   (*c*) Junction of girders and columns.
   (*d*) Wind bracing.
   (*e*) Ladders.
2. LIFTS:
   (*a*) *Top Lift:*
      i. External condition of crown sheets.
      ii. Number of patches on crown sheets.
      iii. Condition of handrail.
      iv. Condition of carriages and rollers.
      v. State of roller lubrication.
      vi. Condition of crown painting.
      vii. External condition of side sheets.
      viii. Number of patches on side sheets.
      ix. Condition of ladder.
      x. Condition of side painting.
   (*b*) *Second Lift:*
      i. External condition of side sheets.
      ii. Number of patches.
      iii. Condition of ladder.
      iv. External condition of cup and grip.
      v. Cup deposits and leakage.
      vi. Condition of carriages and rollers.
      vii. State of roller lubrication.
      viii. Condition of painting.
   (*c*) *Third Lift:*
      i. External condition of side sheets.
      ii. Number of patches.
      iii. Condition of ladder.
      iv. External condition of cup and grip.
      v. Cup deposits and leakage.
      vi. Condition of carriages and rollers.
      vii. State of roller lubrication.
      viii. Condition of paintwork.

(*d*) *Bottom Lift:*
- i. External condition of side sheets.
- ii. Number of patches.
- iii. Condition of ladder.
- iv. External condition of cup and grip.
- v. Cup deposits and leakage.
- vi. Condition of carriages and rollers.
- vii. State of roller lubrication.
- viii. Condition of bottom curb.
- ix. Condition of bottom carriages and rollers.
- x. Condition of paintwork.

3. TANK:
   (*a*) External condition of side plates.
   (*b*) Condition at water level.
   (*c*) Condition at ground level.
   (*d*) Level of water-overflow.
   (*e*) Leakage.
   (*f*) Condition of carriages and rollers.
   (*g*) State of roller lubrication.
   (*h*) Condition of paintwork.
4. MEASUREMENTS:
   (*a*) Horizontal measurements from Lift to Lift at N., S., E., and W. points at Top Cup, Second Cup, Third Cup, and at Tank top.
   (*b*) Vertical measurements from top of Grip to water level at N., S., E., and W. points at Top Cup, Second Cup, Third Cup, and at Tank top.
   (*c*) Positions of Rollers relative to Guides on each Lift.
5. PRESSURE:
   Unusual variations in Pressure Records.
6. REPAIRS AND PAINTWORK carried out since last Annual Inspection:
7. GENERAL:

APPENDIX III.

MEMORANDUM ON THE INSURANCE OF GASHOLDERS.

1. (*a*) In considering the adoption of a Scheme for the Inspection and Insurance of Gasholders, regard should be had, in the opinion of the Gasholder Sub-Committee of The Institution of Gas Engineers, to the extent to which the Gasholders are or could be covered, at normal premiums, by existing Policies, such as Third Party and/or Fire Policies. Further, it should be observed that Insurance Companies will naturally desire to minimize the "risk" and if the work specified in the Inspection Report is not carried out, the Policy may not be renewed, whilst liability in the case of an accident might be disclaimed.
   (*b*) The impression appears to be that the proposed Premiums are high, but it has to be remembered that the cost of an adequate Inspection and Report is substantial and the "risk" (although remote) is a new one, which the Insurance Companies cannot at present accurately assess. After the first few years the Premium on a Policy should be considerably reduced; consequently, lengthy agreements should be avoided, so that the Premium and the terms of the Policy can be revised.
2. (*a*) The Scheme is likely to prove more attractive to smaller Undertakings, since larger Undertakings have the necessary facilities for carrying out their own Inspections and for meeting the consequences of accidents, which in the case of Gasholders are extremely rare. It has been suggested, however, that this immunity from accidents may not continue and that the comprehensive Inspection of a Gasholder is a matter for an expert specializing in that kind of work.
   (*b*) It is with a view to meeting the possible requirements of the larger Undertaking that one Insurance Company is prepared to formulate a Modified Scheme, in cases where Gasholders of recent date are under skilled supervision and the Inspection of the Insurance Company would entail unnecessary expense.
   (*c*) Another Company is prepared to accept the Certificate of the Gas Engineer of the Undertaking concerned for the purpose of the Insurance of its Gasholders. This course is economical and would commend itself to Gas Engineers who dislike the principle of an Inspection from outside; especially when such Inspection is carried out by Gasholder Contractors, subject only to the supervision of the Consulting Engineer to the Insurance Company. In the case of Insurance on such a Certificate, the Policy should be free of limitations as to liability if there is any fault whatsoever in the said Certificate of the Engineer, who for the purpose of certifying should be regarded as the agent of the Insurance Company. Some Undertakings might find it convenient to provide that the Certificate of a Consulting Gas Engineer approved by the Insurance Company, shall be accepted instead of the Certificate of the Gas Engineer of the Undertaking concerned.
3. A Policy for the Inspection and Insurance of Gasholders should be as free from limitations as it is reasonably possible to make it, since the "risk" is a remote one and is only likely to occur as a result of unusual circumstances and conditions.
   The Policy, in which the term "Gasholder" should be deemed to include the Tank, if any, should provide for:—
   I. The ANNUAL EXTERNAL INSPECTION of the Gasholder and the submission of a WRITTEN REPORT thereon.
      If after the INITIAL INSPECTION, the Insurance Company is not prepared to cover the Gasholder, the Undertaking should not be liable for the cost of the Inspection, unless it desires a Written Report, when it should be required to pay a reasonable fee.
   II. INSURANCE against any or all of the following optional "risks":—
      (*a*) DAMAGE TO THE GASHOLDER AND THE OTHER PLANT AND PROPERTY of the Undertaking resulting from Gasholder accidents and breakdowns of all kinds whatsoever.
         i. Repairs necessitated by "FAIR WEAR AND TEAR" would not be covered, but this exception should not extend to accidents or breakdowns resulting fortuitously from "Fair Wear and Tear."
         ii. The risk of damage to the Gasholder from FIRE should not be excluded, unless this "risk" is already fully covered by an existing Fire Policy on the Plant and Property of the Undertaking. In this connection it should be remembered that it might be difficult to determine if a Gasholder accident or breakdown was the cause or the result of Fire. Hence the necessity for cover against all Fire contingencies.
         iii. The Gasholder should continue to be covered when in a CONTRACTOR'S HANDS for repairs.
         iv. Damage resulting from RIOT, CIVIL COMMOTION, AND WAR RISKS would normally be excluded, but damage generally described as due to an ACT OF GOD (*e.g.*, Earthquakes) should be fully covered.
         v. The PREMIUM should be assessed on the merits of each Proposal for Insurance, as judged by the situation, conditions and circumstances of the Undertaking and by the Initial and subsequently the Annual Inspections. A MAXIMUM LIABILITY would normally be provided for under each heading of cover and up to the first £20 or thereabouts of any Claim would generally be borne by the Undertaking. Care should be taken to ensure that the maximum cover is adequate.
      (*b*) LIABILITY TO THIRD PARTIES for damage to Persons and Property.
         i. An EXISTING THIRD PARTY POLICY covering the Plant and Property (including the Gasholder) of the Undertaking may provide for this liability, which might result from an accident or breakdown of the

Gasholder or other Plant. Such Policies frequently extend to ACCIDENTS OCCURRING ON THE DISTRICT in connection with pipes and the fixing of apparatus, due to accidents or breakdown or the fault or negligence of the employees of the Undertaking.

ii. Cover should extend to any LEGAL COSTS incurred by the Undertaking as a result of a Third Party claim.

(*c*) LOSS OF GAS, assessed on the nett cost into holder.

In the case of some Undertakings an accident to a Gasholder and/or its Plant, might result in the closing down of the Works until the damage is made good, but there is no information that cover can be effected by an Undertaking against LOSS OF REVENUE in such an event and for such a period.

(*d*) Liability for DAMAGE FROM AIRCRAFT. Undertakings in the vicinity of an aerodrome or situated in proximity to a recognized air route, should insure against the "risk" of suffering damage to Gasholders from aircraft, but since such cover should extend to the whole of the Plant and to Third Party liability, it would probably be found convenient to provide for this "risk" in a separate Policy. The "risk" normally being exceptionally remote, the Premium should be very small.

CORRESPONDENCE

Holding-Down Bolts of Disc-Type Gasholders

SIR,—I have read with interest the article by Mr. A. Gadd entitled "Holding-Down Bolts of Disc-Type Gasholders," which appeared in the "JOURNAL" dated the 29th ulto. I find, however, that the expression

$$\frac{H^2 (24 + k^2)}{840 (N + 4)}$$

purporting to give the maximum load in tons on the axles of spiral-guided gasholders appears to be incorrectly stated. An exposition of the mistake appearing in Mr. Gadd's original paper on roller pressures (to which he refers) was made in an article contributed by Mr. R. J. Milbourne, which was published in the "JOURNAL" on March 12, 1924.

For a wind pressure of 32 lbs. per sq. ft., and the other assumed conditions, the formula should read:

$$\frac{H^2 (24 + k^2)}{1680 N}$$

which, incidentally, is nearly half the value given by Mr. Gadd when N is large. It is unfortunate that this error involves most of the formulæ in Mr. Gadd's present article.

Yours, &c.,
S. M. MILBOURNE.

31, *Warren Road,*
Cricklewood,
London, N.W. 2,
July 18, 1932.

"The Use of Gas as a Fuel in Industry"

SIR,—With regard to the points raised by Mr. George Helps in your issue of July 6, in connection with the paper which I recently read on "The Use of Gas as a Fuel in Industry" before the Institution of Gas Engineers, I may say that there was no intention whatever of conveying, from certain remarks in the paper referred to, that the employment of a high calorific value gas is necessary in order to ensure a high flame temperature.

As the maximum flame temperature is, to a certain extent, independent of the calorific value, and is ultimately dependent on the thermal capacity, and thus the specific heat of the products of combustion obtained from the particular gas under consideration, it will, I think, be at once evident that, for a given flame temperature, the composition and calorific value might vary over a very wide range, although, in the case of most of the gases employed for industrial work, the total inerts will usually be the deciding factor.

As a typical example, it is often found desirable to employ mixtures of air and gas for certain industrial appliances, particularly in cases where the balance of air required to complete the combustion has to be supplied as secondary air. If the primary air/gas mixture consists of (say) one volume of air per volume of gas, it will be apparent that the calorific value of the mixture supplied to the burner would be half that of the original gas, and, of course, only the balance between the theoretical amount of air required for combustion and the one volume of air already added would be required to complete the combustion at the burner.

It will be obvious that the flame temperature of the gas burned under these conditions will be unaltered. On the other hand, in the case of certain producer gases containing comparatively large percentages of nitrogen, it will be appreciated that the flame temperature obtained when burned under normal conditions (*i.e.*, without any preheating of the gas itself) would be comparatively low, with the result that when heating up a load, even to the comparatively low temperature of 760° C., the rate of heating would be very much lower than that which could be obtained when using gases capable of giving much higher flame temperatures when burned under similar conditions.

While it may be stated that if preheating of both gas and air in such cases can be resorted to, it is quite possible that the elevation of the flame temperature so obtained would result in a very considerable increase in the rate of transfer of heat, at the same time it is not always possible, in practice, to modify existing furnaces or even arrange for gas and air preheating to accomplish this end.

In many of the self-contained producer type furnaces the producer gas is admitted to the combustion chambers at a comparatively high temperature, owing to the fact that little sensible heat is lost during its travel from the producer itself to the combustion chamber, but where the gas is piped from an independent producer to the furnace, the temperature would be such as to demand preheating of both the gas and air used for its combustion, if high flame temperatures are to be obtained, owing to the thermal capacity of the air required for its combustion not in itself being sufficient to take up the whole of the heat of the products.

It will also be appreciated that a similar result might be accomplished by adding further sensible heat to the air from an external source, but this would not generally be found to be efficient.

Yours, &c.,
C. M. WALTER,
Engineer-in-Charge.

City of Birmingham,
Gas Department,
Industrial Research Laboratories,
July 18, 1932.

Mr. *Clark Jackson's Institution Paper*

SIR,—With reference to the criticism which Mr. J. Mogford has been putting up against the paper read by Mr. W. Clark Jackson, of Neath, at the recent Institution Meeting, I feel compelled to send you this letter, as I have known the Neath Gas Undertaking since the early part of 1917.

When I saw these particular works upon my first visit, the plant was in such a poor condition that I mentioned to Mr. Jackson I did not envy him his job of having to carry on in the circumstances which then prevailed.

In the retort house the levels of his hydraulic mains were out by as much as 3½ in.; the condition of the settings was poor, and the subway in which the producer fires were positioned was subject to flooding from time to time, and apart from this was of such a cramped character as to make one feel great pity for the men who had perforce to work in it tending the fires. As far as the general buildings were concerned, there was hardly a whole roof anywhere, and, in fact, the plant was in a really bad condition.

I have visited Neath off and on since 1917 to quite recently, and have been more than impressed by the capable manner in which the Neath Works have been re-designed, and which has proved Mr. Jackson to possess a sound knowledge of Gas Engineering. Not only so, but the general aspect of the works, together with the improved conditions for the workmen, is most marked.

Yours, &c.,
MATT. C. LITTLE.

"*Braeside,*" *Bewdley,*
July 12, 1932.

PERSONAL

Mr. DOUGLAS M'RAE, of Inverurie, Aberdeenshire, has been appointed Manager of Castle-Douglas Gas-Works in succession to Mr. Robert Croll. There were over 50 applicants for the position. Mr. Croll has retired after over 40 years' service.

* * *

On Monday, July 11, Mr. A. W. ELLIOTT, Assistant Engineer and Manager to the Elland-cum-Greetland Gas Company, was presented with a canteen of cutlery, to mark the occasion of his marriage to Miss Mary Ind, of Shrewsbury. The presentation was made by Mr. J. Bridge, Engineer and General Manager, on behalf of the officials, staff, and employees of the Company.

OBITUARY

The death of Mr. HERBERT WHITE, of Willow Bank, Hadley, Salop, took place last week after a long illness. Upwards of 22 years ago Mr. White took up the position of Manager to the Hadley and Trench Gas Company and remained there until it was taken over by the Wellington Gas Company. Great expansion took place under his management, and he was a most conscientious official. A Yorkshireman by birth, Mr. White was well known and respected by everyone with whom he came in contact.

THE NEWS OF THE WEEK

The Annual Meeting of the Swiss Association of Gas and Water Engineers is to be held in Lucerne from Sept. 10 to 12 next.

The Dutch East Indies Gas Company, of Rotterdam, show a net profit for the financial year of 1,976,720 guilders (about £164,727) as compared with 1,966,090 guilders (£163,841) in the preceding twelve months. A dividend of 12½ p.ct. is again being declared.

Dephenolating Plant.—The Glasgow Corporation Gas Committee, we are informed, has had a report by the members of the deputation which visited and inspected the effluent treatment plant at the gas-works of the Manchester Corporation, and recommends that an effluent treatment plant similar to that erected at Manchester be installed at the Provan Chemical Works.

The Matlock Bath Gas Committee have received a letter from the Clay Cross Company offering to supply gas in bulk to Matlock Bath, and stating that they would shortly be in a position to ascertain definitely the quantity of gas they would have available. An interview between representatives of the Gas Committee and the Company is to be arranged to go further into the matter.

Lighting Improvements at Barrow.—At a recent meeting of the Barrow-in-Furness Corporation Gas Committee, the Manager reported on the proposal to light automatically the street lamps, and stated that this could be done effectively with a saving in annual charges of approximately £500, or taking into consideration the Committee's offer to improve the street lighting by the substitution of three and four-cluster burners, at a net saving of £433 approximately. He had obtained a quotation from Messrs. W. Sugg & Co., Ltd., for the supply of burners at a total cost of £171 5s. A decision would have to be made as to the type of automatic controller to be adopted, and he recommended the acceptance of the offer of the Horstmann Gear Company, Ltd., to supply on hire and maintain these controllers for a period of five years at a price of 5s. 3d. per controller per annum. The proposals were approved.

Extension of the Sulzer Dry Coke-cooling Plant at Zurich.—For extending the existing Sulzer dry coke-cooling plant, which is capable of cooling 216 tons of coke per day, the Zurich municipal gas-works have ordered from Messrs. Sulzer Brothers a new plant of the same capacity for cooling the coke obtained from a new battery of horizontal chamber ovens which has at the same time been ordered from the gas-works. The new plant will be constructed for the same steam pressure as the old one—*i.e.*, 185 lbs. per sq. in., and will work in parallel with it, delivering the steam produced in the same system of piping. When completed the plant will be capable of cooling about 490 tons of coke per day, and raising about 200 tons of steam at a pressure of 185 lbs. per sq. in.—*i.e.*, an average of about 8 tons of steam per hour, thus covering the greater part of the requirements of the gas-works and effecting a considerable economy in fuel. It is interesting to note that the Zurich municipal gas-works is at present producing a dry coke which can easily compete with coke from coke ovens.

Important Experiments are being made by the Chesterfield Corporation in the use of gas for transport purposes, special cylinders for the storage of gas under high pressure are being made. The scheme is so far advanced that it is expected a Corporation vehicle will shortly be equipped with gas apparatus for experimental purposes. It is considered there will be a distinct saving in running costs by the use of gas as compared with petrol.

Organized by the Wigan Gas Department, an exhibition was opened recently in the Court Hall, Wigan. A strong feature was made of cookers. Alderman J. McCurdy, J.P., Chairman of the Gas Committee, who presided over the opening proceedings, said the Wigan Corporation had 27,000 gas consumers, and the object of the exhibition was to show on a large scale the latest developments in gas appliances so useful in the home. The Mayor commented upon the rapid developments which had taken place in the use of gas and remarked that history proved that Wigan as a town was one of the oldest users of gas in the country. The Gas Undertaking, he said, was in a healthy condition and would soon be out of debt.

The Westminster Gas Lighting Contract: A Magnificent National Publicity Scheme.

Gas Light and Coke Company's Enterprise on Behalf of the Industry.

The Gas Light and Coke Company are taking advantage of their new contract with the City of Westminster to give national publicity to the excellence of gas as an illuminant. An advertisement is being inserted this week by the Company, large enough to dominate the page on which it appears and to be seen in "The Times," "Daily Telegraph," "Morning Post," "Daily Mail," "Daily Express," and other national morning and evening papers. A gas lamp and standard run across the advertisement, leaving the top corners in shadow and throwing light on the figures of a man and a woman silhouetted against a map of the West End streets affected by the new contract.

"Westminster again chooses Gas" is the message surrounding this map, under which comes the heading "Gas to light Regent Street, Pall Mall, Whitehall till 1947. . . .

> "Great modern cities must have their streets brilliantly lit . . . reliably lit. The City of Westminster has again chosen to light 55 miles of its streets—brilliantly . . . reliably . . . by gas . . . and for another 15 years. A great contract . . . just signed . . . affecting more than half the West End of London . . . running until 1947 . . . given to gas. Not only in the City of Westminster but in nearly a hundred other municipalities streets are lit by the Gas Light and Coke Company. 50,000 street lamps in all. A big undertaking? Yes. But only a tiny fraction of the Company's whole load for cooking and heating in more than a million London homes and over 2000 London trades."

Down the right-hand side of the advertisement is a list of "world famous" London streets lit by gas. It runs:

" Pall Mall, Parliament Square, Whitehall, Buckingham Palace (frontage), Regent Street, Piccadilly (from the Circus to Albemarle Street), New Oxford Street, Shaftesbury Avenue, Coventry Street, Aldwych, Kingsway, Fleet Street, Queen Victoria Street, Birdcage Walk, Victoria Street, Buckingham Gate, Constitution Hill, Carlton House Terrace, St. James's Street, Sackville Street, Savile Row, Jermyn Street, Millbank, Charing Cross Road, King's Road, Bayswater Road."

Somewhere about seven million people buy copies of the papers in which this advertisement is appearing, so it should help to dispel the illusion (still more popular than it should be) that gas lighting is old-fashioned. The fact is, of course, that, for purposes of public illumination, the most serious enemy to gas is ignorant prejudice in favour of electricity. Many a borough councillor who, on his visits to London, has walked through the West End unconscious that it was gas lit, has returned to argue in favour of electricity in the streets at home, on the ground that it was brighter and more up-to-date.

The City of Westminster's emphatic decision should be made known to every local authority in the country and also to the general public, whose attitude towards the domestic uses of gas may be affected by what is certainly a signal " prestige " triumph. Any gas man who is sceptical of this will be convinced if he asks himself what sort of a song there would have been had 55 miles of central London just gone over to electricity.

South Normanton Return to Gas for Street Lighting.

The South Normanton (Derbyshire) Parish Council, after some interesting experiments, have decided to return to gas for the lighting of the streets of the parish, instead of making the whole street lighting system electric.

Under agreements with the Electric Power Company street lamps were converted from gas to electricity. The Electric Company for the conversion of the remaining lamps from gas to electricity quoted £2 10s. per lamp and £3 15s. per lamp for maintenance. The Blackwell Gas Company stated that they would install new three-burner units, new reflectors, and automatic lighting and extinguishing apparatus, under a five-years' agreement for £1 per lamp; and if a fifteen-years' agreement was made these improvements would be installed free. Their charge for maintenance, supplying new mantles, and cleaning the lamps would be £2 10s. per lamp under five or fifteen years' agreements.

It was stated that by adopting gas the Council would save over £22 on conversion and an average saving of 7s. 6d. per lamp on maintenance. The Council decided to ask the Gas Company to convert the electric lamps to gas and to continue the lighting of the parish by gas for three years.

Twenty-Fifth Anniversary Convention of the Canadian Gas Association.

Mr. Hugh McNair, a native of Scotland, who has been elected to a second term of office as President of the Canadian Gas Association, is to be heartily congratulated (states the " Inter-Colonial Gas Journal of Canada ") on the excellent programme of both entertainment and business which he provided for members and friends at the 25th Anniversary Convention of the Canadian Gas Association, recently concluded at Winnipeg, Manitoba. His Presidential Address gave a splendid insight into the growth of the organization since 1907.

The report of the Secretary and Treasurer (Mr. G. W. Allen) on the finances of the Association, and his report of the Laboratory Approval Division, reflected a very healthy and prosperous condition of affairs. The membership remains practically the same as last year, and the balance to the credit of Association, notwithstanding heavier expenditures during the year, also remained practically the same as in 1931. Mr. Allen stated that there did not appear to be any need for pessimism, and said that most of the dues were paid well in advance, apparently a sign of improving business conditions.

The Association decided to affiliate with the International Gas Union, with headquarters in Paris, the International body being made up of most Gas Associations throughout the world.

Hearty greetings and best wishes were extended by Mr. Arthur H. Lymn, M.I.Chem.E., F.Inst.F., representing the Society of Britsh Gas Industries, while Major Alexander Forward, of the American Gas Association, extended best wishes of his Association.

THE NEWS—continued.

Bristol Gas Company's Special Service to Industrial Consumers.

The Bristol Gas Company have just organized a new service for the users of gas for industrial purposes.

A special staff has been engaged to see that consumers obtain the best results from industrial gas, and periodical inspections are made of the installations free of charge.

The Company feel that a great deal of gas is wasted through inefficient and improperly adjusted appliances, and heat specialists, technically trained, are being employed to give advice to consumers and make adjustments and tests.

Increased Uses for Coal.

Objects of New Utilization Council.

The Labour Correspondent of " The Times " writes: The new Association that is being formed by the Mining Association, in conjunction with the Coal Merchants' Federation, the Coal Exporters' Federation, and the National Council of Coal Traders, to promote an extended and progressive use of coal and its products, is to be named the Coal Utilization Council. Its object will be to make coal more serviceable to the community. To this end it will endeavour to make known the best ways of using coal and the latest appliances for consuming coal economically and conveniently.

New methods in salesmanship are to be studied, supplementary services developed, and, indeed, there is the intention to provide, by publicity, a popular education in the possibilities of coal as the servant both of the manufacturer and of the private citizen. There will be parallel activities in research and in practical means of overcoming the disadvantages which coal may have in certain circumstances in comparison with other fuels. Broadly stated, the idea is that the consumer shall be assisted to get more out of coal.

The general scheme of the Council's work will be in the charge of a director, who has yet to be appointed. The post will require exceptional qualifications.

National Gas Council.

Meeting of the Central Executive Board.

A Meeting of the Central Executive Board of the National Gas Council was held at 28, Grosvenor Gardens, London, S.W. 1, on Tuesday, July 12.

Pending the re-election of a Chairman of the Board for the ensuing year, Mr. John E. Daw, J.P., was voted to the Chair.

Election of Chairman of the Board.—Sir David Milne-Watson, LL.D., D.L., was unanimously elected Chairman of the Board for the ensuing year.

Election of Vice-Chairmen of the Board.—Mr. Wm. Cash, J.P., Mr. Frank H. Jones, and Alderman J. H. Lloyd, J.P., were unanimously re-elected Vice-Chairmen of the Board for the ensuing year.

The late Mr. Geo. Keillor.—The Chairman reported with very great regret the death of Mr. George Keillor, the Engineer and General Manager of the Greenock Corporation Gas Department, on June 24. Mr. Keillor was a man of great ability, and was generally recognized as one of the Industry's most promising men, whose loss they could ill afford. It was agreed that a letter of condolence be sent to the relatives and to the Corporation of Greenock, and a vote of sympathy was passed, all standing.

Gas Legislation.—Proceedings of Departmental Sub-Committees.

(1) It was reported that the Report of the Sub-Committee on Rationalization and Joint Working had been drafted, but that there were still one or two points to be settled before it could be finally approved by the Committee.

(2) It was stated that the Report of the Sub-Committee on Gas Charges was also in draft, and that a further meeting of the Sub-Committee was being held during the week for consideration of this Report.

Gas Undertakings Bill, 1932.—It was reported that this Bill had now been passed by the House of Lords, and only awaited the Royal Assent.

The thanks of the Board were accorded to Sir David Milne-Watson for the active part which he had taken in connection with this Bill, which it was felt would be of considerable assistance to the Industry.

Kettering Gas Bill, 1932.—It was reported that this Bill, which was promoted by the Kettering Gas Company with the support of the National Gas Council in order to prevent the Urban District Council from prohibiting the use of gas

THE NEWS—*continued.*

in Council houses, had now passed through both Houses of Parliament, and only awaited Royal Assent.

Town and Country Planning Bill, 1932.—It was reported that the Conjoint Conference of Public Utility Associations had been completely successful in obtaining the incorporation of their amendments in this Bill. The effect of these amendments was that land, whether scheduled or otherwise, belonging to Statutory Undertakers could not without their consent (*a*) become the subject of schemes prepared by Town Planning Authorities, or (*b*) be acquired compulsorily. If, however, the Minister of Health considered that consent had been unreasonably withheld, then he was compelled to hold a public inquiry before any Order was made in the matter. The result was that Gas, Water, and Electricity Undertakers would be on the same footing as railways, and would, it was thought, be adequately protected.

Coal Mines Act, 1932.—It was reported that, since the previous meeting of the Board, the Government had introduced the Coal Mines Bill, the main object of which was to continue Part I. of the Act of 1930 for a period of five years. Strenuous efforts had been made on behalf of Public Utility Undertakers before the Bill was introduced, to secure protection for such Undertakers, but when the Bill was printed it was found to be so drafted as to preclude any amendments with regard to the operation of Part I. of the Act of 1930. An amendment was thereupon tabled to continue Part I. for a period of one year instead of five years, but this amendment was not successful.

Road and Rail Transport.—It was reported that a Memorandum had been submitted to the Road and Rail Conference on behalf of the Conjoint Conference of Public Utility Associations for the purpose of rebutting the suggestion that Public Utilities were not bearing their fair share of the burden of road taxation having regard to the damage which it was alleged they were doing to the roads in breaking them open for the purpose of laying, renewing, &c., their sub-surface works.

Gasholders.

(*a*) *Inspection and Insurance.*—The Report of the Gasholder Sub-Committee of the Institution of Gas Engineers dealing with the Inspection and Insurance of Gasholders was considered and adopted, and it was decided that a copy should be forwarded to all members of the Council for the special guidance of those Undertakings who desired to make arrangements with an Insurance Company for the inspection, maintenance, and insurance of gasholders.

(*b*) *Proposal of the Community Council of Kent that Gasholders should be painted to harmonize with the surrounding neighbourhood.*—It was reported that the Community Council of Kent had recently written to a local Gas Company enclosing some notes with regard to the painting of gasholders. These notes had been prepared at the request of the Standing Art Committee of the Royal Institute of British Architects. The Community Council had asked the Gas Company for their sympathetic consideration of the points raised. It was agreed that the Memorandum from the Community Council be referred to the Institution of Gas Engineers for consideration and report.

British Refractories Research Association.—It was agreed that, in view of the valuable work accomplished by this Association, an immediate appeal be sent out to Gas Undertakings on behalf jointly of the National Gas Council and the Institution of Gas Engineers, asking Undertakings to increase their support to the funds of the Association to enable their research work to continue.

World Power Conference—Proposed Chemical Engineering Conference, 1934.—A letter from the British National Committee of the World Power Conference was considered, with regard to a proposed Chemical Engineering Conference to be held as a Sectional Meeting of the World Power Conference in the autumn of 1934. The Board agreed that the name of the Council should be lent to the proposal.

Gas for Stand-by Lighting in Places of Public Entertainment.—Members were reminded that, following a deputation from the National Gas Council to the London County Council earlier in the year, the latter body had decided not to proceed with their proposed Regulations, the effect of which would have been to exclude the use of gas for safety lighting in places of public entertainment.

It was now further reported that the London County Council at their meeting on July 5 had decided to amend their previous Regulations made under the Metropolis Management Act, 1878, the practical effect of which would be to necessitate the use of gas for safety lighting unless electricity was available not only from a public supply but also from a generating plant or storage battery actually situated on the premises.

It was stated that the particular attention of members would be called to this question in the Council's Monthly Reports, seeing that a certain number of Provincial Undertakings had experienced difficulty in this regard.

It was agreed that the next meeting of the Board should take place on Tuesday, Sept. 13.

Terms Used in Illumination.

The British Standard Glossary of Terms used in Illumination and Photometry, which was issued in 1925, has just been revised to bring it up-to-date and in line with the decisions reached at the meetings of the International Commission on Illumination last year.

Copies of this British Standard (No. 233-1932) may be obtained from the Publications Department, British Standards Institution, 28, Victora Street, London, S.W. 1, price 2s. 2d. post free.

International Congress on Commercial Education.

The Economic Course (July 14-21) which forms the prelude to the International Congress on Commercial Education (which opens on July 25) was inaugurated last Thursday at the London School of Economics.

Sir Francis Goodenough took the Chair at the opening meeting at which more than 200 students from nineteen countries were addressed by Sir David Milne-Watson (President of the International Congress), Sir William Beveridge, and Mr. Ch. E. H. Boissevain (President of the International Society for Commercial Education).

In the afternoon Mr. Louis H. Kiek took the Chair, and an address was delivered by Mr. Hartley Withers on "The British Banking System."

The Course is designed to give a broadly drawn, although necessarily incomplete, sketch of some of the chief economic factors in the life of this country.

Gas Wins Great Fight for Public Lighting.

The following report of a London member of the Joint Lighting Committee of the Institution of Gas Engineers was submitted to us as a result of a recent tour in the North, during which he was much impressed by the circumstances relating to this latest victory for gas for street lighting.

For many months past there has been a public demand for better lighting of the main streets of Cleethorpes, a growing seaside resort near Grimsby, and the matter has been debated at great length from time to time by the local Council, the Ratepayers' Association, Chamber of Trade, &c.

Now, it has to be pointed out that, whereas gas at Cleethorpes is supplied by private enterprise, the electricity supply is a municipal undertaking, and it will be realized, therefore, that the gas authorities had a very stiff proposition. However, persistence on their part secured as a first step the installation of three lamps each, gas and electric, to a common duty specification, and exhaustive tests of these were then made. There followed unjustified claims that the electric lamps were more efficient and cheaper, and it is to the very great credit of the Cleethorpes Gas Company that they strenuously and persistently refuted these statements by a recital of the plain facts, which really constituted an appeal to the fairmindedness of the Council. Indeed, they went further than this by sending a letter on the subject to the electors of a Ward in which a by-election happened to occur.

Months went by, and it appeared that the electrical interests would prevail. A meeting of the Ratepayers' Association passed a resolution urging the Council to adopt electricity for street lighting where the mains were laid. This would have daunted many, but not the Cleethorpes Gas Company, who immediately arranged that another meeting of the Ratepayers' Association should be addressed by their Secretary and Engineer, Mr. F. G. Brockway, who did his job to such purpose that the previous resolution was practically rescinded, and another passed urging the Council to provide better street illumination, whether gas or electricity, to be decided by the cheapest tender based on the cost per candle power.

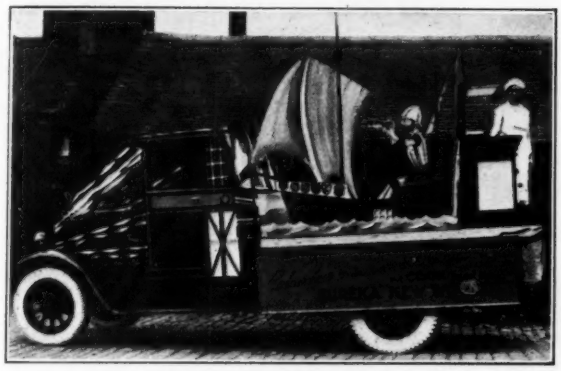
In the course of a very excellent speech, which made a big impression on his hearers, Mr. Brockway not only gave figures proving gas to be cheaper, duty for duty, at Cleethorpes, but also instanced the public lighting at Scarborough, Birmingham, and Lewisham (London) in support of his case. The happy culmination of the whole affair is that the Cleethorpes Gas Company has obtained the contract for the lighting.

The Cleethorpes Gas Company is to be congratulated on

this successful conclusion to its untiring efforts. The story stands as a great example of what can be done by persistence and enterprise, coupled, of course, with recognition of the fact that cost must be cut to the absolute minimum.

The streets in question are Isaac's Hill, High Street, and Grimsby Road—the main tram route—and the lamps to be employed are Sugg's "Rochester" Suspension Lamps, with rustless steel Directional Reflectors, carried on bracket arms projecting 7 ft. over the roadway. The Council's specification called for illumination in accordance with Grade E of the British Standard Specification for Street Lighting.

Columbus Discovered America – But Cook found the "Eureka New World."



This photograph shows the effective display of the Leek Urban District Council Gas Department at the Local Carnival held on Saturday, July 9. It was successful in obtaining a first prize and cup in its class.

London Colney Tenants Forced to Use Electricity.

[From the "Herts Advertiser."]

The petition signed by twenty residents of Birkfield Cottages, London Colney, requesting that gas cookers be installed in their Council houses instead of electric cookers, submitted at a recent meeting of St. Peter Rural Parish Council at London Colney, and referred to in the "JOURNAL" for June 29 (p. 868), came before the St. Albans Rural Council recently.

A letter from the North Metropolitan Electric Power Supply Company gave results of the first six months' supply of electricity to the houses in question. Assuming an annual consumption on the basis of the figures for the half-year, it was stated that the consumption for the 34 houses would be 320 units per house, which on the average price obtained of 3·4d. per unit would amount to £4 11s. per house, for combined lighting and cooking. Experience had shown that the average lighting consumption for houses of that description was 110 units per house per annum. The district rate in London Colney for lighting purposes was 8d. per unit, which was equivalent to £3 13s. 4d. a year for lighting supplies, leaving a balance of 17s. 8d. for 210 units used for cooking or an average price of one penny per unit.

Reference had been made to one tenant having spent £3 3s. in less than six months. The heaviest consumer in Birkfield Cottages had in fact paid £3 4s. in six months, his consumption averaging 11·4 units per week. His average price per unit was 2·59d. and his total payments for lighting and cooking over the period averaged approximately 2s. 5½d. per week. Assuming out of a total consumption of 592 units per annum 130 units were used for lighting, leaving 462 units for cooking, the amount for lighting at the present flat rate would be £4 6s. 8d. and for cooking £2 1s. 4d.—an average of 1·06d. per unit.

Reference had also been made to the insertion in the meter by one consumer of 7s. before light could be obtained. That would indicate that the premises had been unoccupied for over six weeks, which was surely exceptional, and in any case the tenant was no worse off in that respect than he was in the case of his rent. That amount spread over the total consumption for the year would make hardly any appreciable difference in the price per unit.

The Surveyor said that fire places with cooking facilities as well as electric cookers were provided in the houses, but it was desirable that tenants should use the electric cookers from the point of view of cleanliness and saving the Council expense in the matter of re-decorations. Before the installations were made the Council not only approached the Company, but other Local Authorities, who strongly recommended the adoption of electrification in housing schemes.

Mr. C. F. Sibley declared that electric lighting cost him about five times as much as gas.

Mr. A. H. Watson, Resident Engineer to the Company, said the average cost to the tenants for lighting and cooking was 1s. 9d. per week.

The Chairman pointed out that the tenants were getting electricity at a much lower rate by using it for both lighting and cooking.

It was decided to reply to the tenants that the Council was not prepared to vary the means of lighting and cooking, and any assistance or advice required would be readily forthcoming from the Company.

Institution of Gas Engineers.

Inspection and Insurance of Gasholders.

The 1st Report of the Gasholder Sub-Committee to the Council of the Institution of Gas Engineers, dealing with the Inspection and Insurance of Gasholders, has been published by the Institution. Copies can be obtained without charge by members of the Institution, and by others at a charge of 1s. 6d. per copy, including postage.

The Report emphasizes the necessity for the periodical inspection and maintenance of gasholders and gives specimen Record Forms for the recording of the periodical and annual inspections carried out. Recommendations are made as to the matters to be observed in considering if it is desirable to insure against the risk of suffering damage from gasholder accidents and breakdowns.

War Loan Conversion and the Benevolent Fund.

The Council of the Institution of Gas Engineers has resolved to convert the whole of its holdings of 5 p.ct. war loan, 1929-47 into the new 3½ p.ct. War Loan.

This, however, will mean that the income hitherto derived by the Benevolent Fund from War Loan (the Fund does not pay income-tax) will be reduced by no less than 30 p.ct. This is a substantial loss to a Fund which has to restrict its grants, however distressing the applicants' circumstances may be, to weekly payments of between 15s. and 20s. each and which, it would appear, will have to be reduced.

Although during the past two years the number of contributors to the Fund has been increased from 518 to 821, the response does not accord with the privileges and responsibilities of members of the Institution of Gas Engineers, of which there are now nearly 1500.

It is sincerely to be hoped that the reduction in the income of the Fund by reason of the substantial fall in the yield from Government Securities, will be made good by every Chartered Gas Engineer becoming a subscriber, if only for small amounts.

Further particulars and, if desired, a Bankers Order Form, can be obtained from the Hon. Secretary of the Fund (Mr. J. R. W. Alexander), 28, Grosvenor Gardens, London, S.W. 1.

"Gas Fire Flues and Ventilation."

We have received from the Secretary of the Institution of Gas Engineers an Errata Slip for Communication No. 50, "Gas Fire Flues and Ventilation," by C. A. Masterman and T. G. Noble.

Members of the Institution and others having copies of this Paper—presented at the 69th Annual General Meeting in June last—are invited to apply to The Secretary, The Institution of Gas Engineers, 28, Grosvenor Gardens, London, S.W. 1, for a copy of the Errata Slip, enclosing a stamped and addressed envelope.

So far as the "JOURNAL" references are concerned, these errata are as follows:

"JOURNAL" pages (Vol. 187).

P. 747, col. 2, at the end of the first paragraph after "of 1500 c.ft." add "(Gas rate about 2000 B.Th.U. per radiant per hour)."

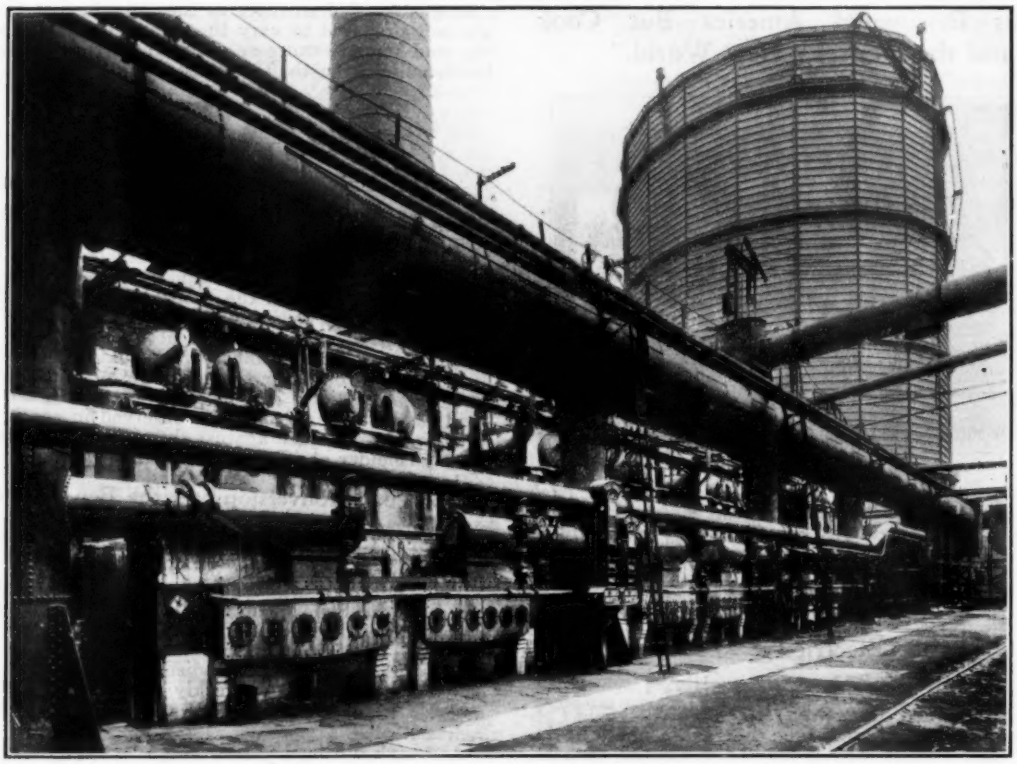
P. 748, in line 5 of last paragraph, col. 1, for "local restriction of area" substitute "locally restricted area of."
In line 8 of same paragraph, for "local restriction of area" substitute "locally restricted area of."

P. 750, Table I., Section D. After "two abrupt 90° elbows" and before "or terminal" insert "and horizontal length."

CO-ORDINATED HEAT - CONSERVATION -

Scheme at the Normanby Park Works of John Lysaght, Ltd.

By W. J. Brooke, General Manager of the Normanby Park Works.



INDICATORS SHOWING STATE OF BLAST FURNACE GAS AND COKE OVEN GASHOLDERS SITUATED AT BOILER PLANT.

Briefly the idea underlying the whole scheme is based on the fact that the low iron content of the local ores necessitates the use of a large quantity of coke in the manufacture of pig iron, and provided the coke thus required is manufactured at a plant in close proximity to the blast furnaces, the gas from the coke in the blast furnaces and the rich gas from the coke ovens can be together or separately utilized for all the heat requirements in the making and rolling of the steel made from the pig iron.

During 1927 and ensuing years the project was studied in minute detail by the Engineering and Metallurgical Staffs on the Works, and a complete scheme was eventually evolved which was sanctioned by the Board of Directors, and has since been completed and put into operation.

Prior to the commencement of the new extensions the works consisted of mines, from which the local ore is quarried; and there were also two batteries each of 48 coke ovens, producing together 2800 tons of coke per week. These have now been dismantled.

Five blast furnaces were installed, three of a nominal capacity of 1000 tons each per week, and two of 1400 tons each per week. The plant is comparatively modern in layout, and designed to dispense with surplus labour wherever possible.

The steel plant consists of four 50-ton open hearth furnaces, one 120-ton tilting furnace, one 50-ton Terni fixed furnace, and one 60-ton fixed furnace. These, and a 350-ton mixer, were fired by gas from a battery of Kerpeley gas producers fitted with Chapman agitators. Here again the furnaces were of a modern type.

Ingots are heated in four gas-fired soaking pits supplied with blast furnace gas, and usually this was enriched as far as possible with any surplus gas that could be obtained from the old coke ovens.

Further ingot heating capacity was provided by four recuperator pits, which had been converted out of ordinary coal fired pits to a design introduced and perfected by the works staff.

The rolling mills are designed for the production of sheet bars and billets capable of producing up to 4000 tons per week of semi-finished products.

For a number of years the surplus gas from the blast furnaces and coke ovens was employed as far as possible in order to replace solid fuel to the extent that no coal was used in the rolling mills, all the steam having been raised and ingots heated by means of blast furnace gas *plus* a little coke oven gas. Coal, however, was still being used at the steel furnaces in gas producers for the production of ingots.

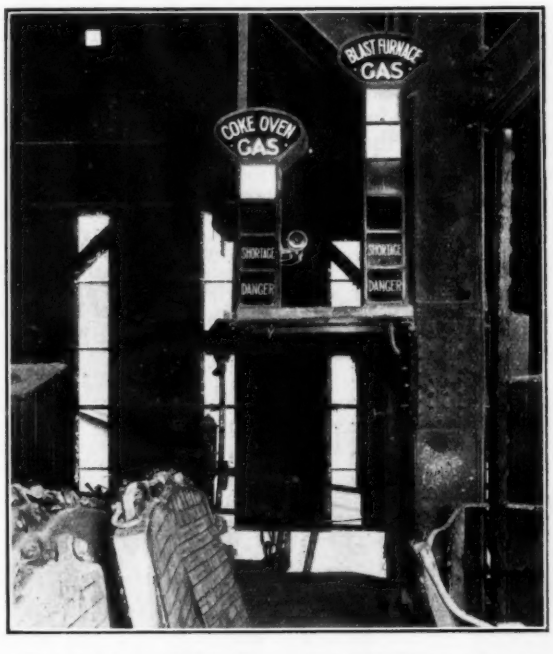
In order to get the best results from the blast furnace gas, each furnace was fitted with plant for the partial cleaning of gas by means of water spray towers and fans, this partially cleaned gas being used at the boilers and soaking pits. A portion of the gas was, however, further purified by means of Theissen washers, from which it was conducted into a gasholder and thence to the gas blowing engines and for generating electric power.

The exhaust steam from the mill engines passed into a battery of Rateau steam accumulators, and was thence utilized for the production of electrical power in mixed pressure turbines. Additional blowing power was also obtained from this exhaust steam by means of a mixed pressure turbo-blower, capable of delivering 45,000 c.ft. of air per minute at a pressure of 10 lbs.

It will thus be seen that considerable headway had been made in the utilization of waste gases. The cycle, however, was not complete. Additional coke in considerable quantities had to be purchased in the open market to make the necessary quantity of pig iron required, and coal was being used in producers for the production of ingot steel. The

new scheme—previously referred to—was therefore brought into being to remedy these deficiencies.

Seeing that the blast furnaces and coke ovens together would under the new conditions have to supply the whole of the heat requirements of the works, it was necessary to do everything to ensure that both these departments should be as perfect as possible, and capable of giving an ample and regular supply of gaseous fuel.



Control Instruments indicating position of blast furnace gas and coke oven gasholders.

The modern coke oven had been brought to a very high degree of perfection, and it was necessary only to select the type that commended itself to the technical staff. It was felt that the institution of modern coking practice would give the best possible quality of coke from the coal available, and that this would contribute to a large extent to the regular working of the blast furnaces.

New Coke Ovens.

The b ttery of 47 coke ovens, of Becker design, and constructed by the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., is described in detail elsewhere in this "JOURNAL."

To obtain the fullest control over the supply and use of blast furnace gas, the whole of this system is controlled by means of a 2 million c.ft. "M.A.N." waterless gasholder, installed by Messrs. Clayton, Son, & Co., Ltd. This is connected in parallel with the blast furnace gas system, and maintains a uniform pressure throughout of 5 in. water gauge.

To make use to the highest point of efficiency of the thermal units available in the gas supplied from the furnaces and coke ovens, the latter are heated by blast furnace gas cleaned by Theissen rotary washers to 0·003 grain per c.ft., thus leaving the whole of the rich coke oven gas available for use on the works as and where most desirable. The decision thus made has been fully justified in that it is found possible to produce and maintain a more even heating of the coke oven gas flues by the use of this gas than can be obtained with oven gas itself.

Blast furnace gas is also used for the raising of steam in one battery of thirteen Babcock water-tube and four Lancashire boilers. The production of steam is centralized, all departments being supplied from this unit. The firing of these boilers is normally by blast furnace gas, but coke oven gas can also be used, or—if necessary—a mixture of the two, special gas burners having been designed for this purpose. The auxiliary coke oven gas supply to the boilers assures a regular supply of steam, whereby a temporary interruption of the blast furnace gas supply may by a re-adjustment on the plant be replaced by coke oven gas to supplement any shortage.

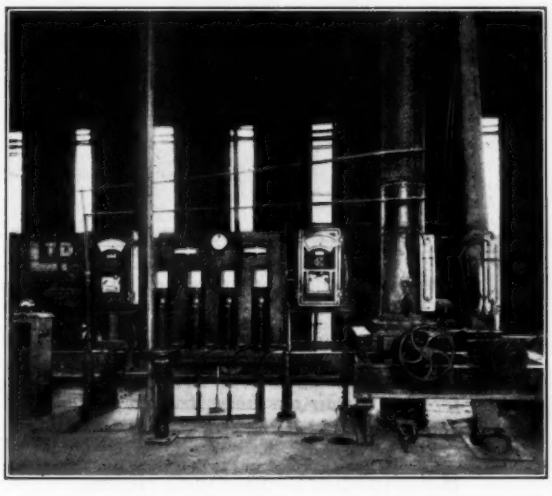
Further, should for any reason the necessity arise for the blast furnace plant to be isolated from the system, the rest of the plant can be kept alive by using coke oven gas.

The steel furnaces are now heated by means of a mixture of blast furnace and coke oven gases, the supply of which is regulated by meters which are both indicating and recording. A combination arrangement has been fitted so that the B.Th.U. content of the mixed gas can be kept constant by operating one valve only. If at any time—by reason of furnace conditions—it is necessary to alter this mixture, it can be easily done by a clutch attachment which has been fitted to the coke oven gas valve. Gauges for indicating the gas and air pressures on the incoming end, and gas and air suction on the outgoing end, are also used on each furnace. These are also recording instruments. Ardometers are installed for recording the air checker temperatures. Waste gas temperature indicators are also used. The furnaces are fitted with fans for giving a positive air supply into the furnaces, and they are also arranged that the quantity of air being used can be measured at any time. By the installation of these instruments all the essential information with reference to combustion is readily available, and the men have now been trained to work the furnaces by the indication of these instruments.

Control of Gas to the Furnaces.

In carrying out this departure from the usual producer practice, it has been decided to make little or no alteration in furnace design in order that, should occasion arise, the furnaces could be again heated with producer gas if required. It has therefore been necessary to mix the two gases in such a proportion as will give the corresponding heat value of the producer gas thus displaced. In practice it is found that this works out at approximately 100 parts of blast furnace gas to 40 of coke oven gas, both by volume. This proportion can be varied by the furnacemen if necessary, and experience has shown that adjustments of this character can be very advantageously made use of to assist in accelerating furnace reaction. It has already been found of enormous value to be able to control and assess at any time the actual quantity of gas passing into the furnace, and considerable economies in fuel have already been made possible.

It was originally contemplated that four blast furnaces would be required in order to provide sufficient gas to complete the cycle, in which case a small quantity of coke would have to be purchased outside. Owing to the condition of trade it has not been possible to work four furnaces, and the plant has been carried on by means of three. This deficiency has to a certain extent been made up by the prior preparation of the ore and the excellent quality of the coke from the ovens, which has increased the outputs of the furnaces by approximately 150 tons of iron per week



Control Instruments at open hearth furnaces showing gas meters and regulators.

per furnace. On the other hand, while it was expected that the factors just mentioned would tend to reduce the consumption of coke per ton of pig iron, the actual results obtained have been far in excess of anticipation. The economic value of the scheme has therefore produced its own Nemesis in that less coke has been produced per ton of iron than anticipated, and consequently less gas has been available. Attention has therefore had to be concentrated on utilizing to the utmost possible extent waste heat, and this has been done by means of Spencer-Bonecourt waste-heat boilers fitted to each of the open hearth fur-

naces in order to supplement the steam supply and reduce the quantity of gas necessary for the steam-raising plant.

Completely Balanced Plant.

Partly owing to the installation of the gasholder, and the extreme regularity of supply of gas from the coke ovens, improvements in design at many points where gas is being consumed have been made, and it has thus been possible to obtain a self-contained and completely balanced plant.

The coke from the ovens is sufficient to make the pig iron for the production of the ingots necessary to maintain the rolling mills in full potential output. At the present moment, owing to the low demand for steel, it is not possible to convert the whole of the pig iron into steel, and a certain quantity is therefore made for sale.

It can thus be seen that the only coal necessary for the operation of the whole plant is that which is charged into the ovens, it being now possible to convert all the iron manufactured into steel and roll it in the mills without the use of any extra solid fuel. One ton of steel, including the pig iron for its manufacture, can be produced and rolled by the use of approximately 30 cwt. of coal. After exhaustive investigation and research the quantity of gas available to obtain this balance was calculated on the normal efficient working, on the one hand, of the blast furnaces and coke ovens producing the gas, and, on the other hand, of the various departments using it. The quantity of gas per hour from the blast furnaces and coke ovens is pooled and considered as unity. The following is the percentage distribution of the available total heat to each of the departments.

Coke ovens	14·5
Stoves	11·2
Boilers	27·2
Soaking pits	9·8
Power house	7·5
Steel plant	29·8
	100·0

The plant as described is now in a state whereby all the various departments are inter-linked the one with the other, and in order to maintain the closest co-operation between these various departments it has been necessary to install indicators at all points where gas is being used, whereby the men in charge may have full knowledge of the position of the gas supply at both the coke ovens and blast furnaces at any moment. The blast furnace and coke oven gasholders are fitted with a device which gives a distance indication to each of the departments using gas, and indicating the quantity of gas in the holders at any moment. When the holder reserve approaches the danger point, audible signals are given by means of hooters and sirens.

The scheme for heat conservation—above outlined—was drawn up and carried out by the Normanby Park Works Staff in its entirety, and credit is due to the Chief Engineer, Mr. F. H. B. Gough, and his Assistants for the work they did in this connection.

A TOPICAL WINDOW DISPLAY

With public attention focussed so effectively upon the National War Loan Conversion Scheme, Richmonds Gas Stove Company, Ltd., have taken the opportunity of linking this up with a "Domestic Conversion Scheme," which suggests a change over from the old to the new methods of cooking—"a great move towards new and better times." The Display, which is here illustrated, has been arranged in Richmonds' Queen Victoria Street Showrooms, and includes two of their well-known "Bungalow New World" cookers. Topical displays of this kind are always of special interest, and this one has attracted a good deal of attention in the City.

B.S. Specification for Xyloles.

One of the functions of the Chemical Section which has been formed in the re-organized British Standards Institution has been to take over standards which had been previously prepared by various sections of the chemical industry, and, having ensured that they are satisfactory to users and manufacturers, to issue them as British Standards. Under this scheme the standard series of specifications prepared by the National Benzole Association are being reviewed by a representative Committee of the Institution.

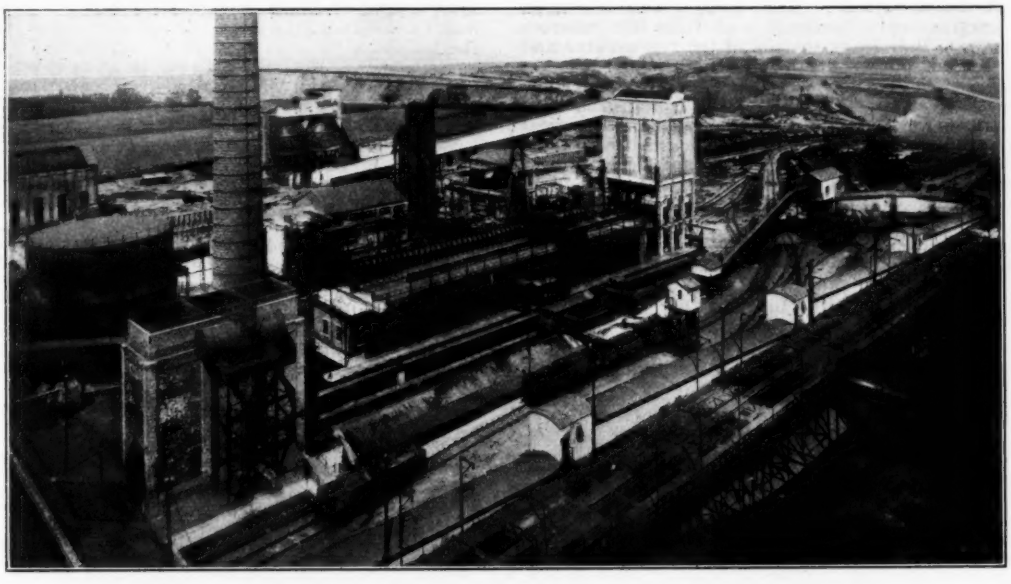
The recent issue of B.S. Specification No. 458-1932 for Xyloles forms the first of the series and provides for three grades of xylole—viz., pure xylole, 3° xylole, and 5° xylole. The specification includes clauses governing requirements for colour, specific gravity, freedom from water, alkali, acids, sulphuretted hydrogen, distillation range, and residue on evaporation. Complete information as to the methods of testing are given in seven appendices, while a further appendix defines in detail the type of apparatus to be used in the various tests. The methods of test are those which after very careful consideration have been prepared by the Standardization of Tar Products Test Committee.

The issue of these specifications as British Standard will secure for them wide recognition, and they should prove of interest both to purchasers of this material as a means of obtaining a reliable standard quality, and also to manufacturers, in that it will enable them to grade their products for sale purposes.

Copies of this specification (No. 458-1932) may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W. 1, price 2s. 2d. post free.

: Becker Coke Ovens and : Bye-Product Recovery Plant

Installed at the Normanby Park Works of John Lysaght, Ltd.



GENERAL VIEW OF BECKER COKE OVEN AND BYE-PRODUCT PLANT AT NORMANBY PARK.

Foreword.

Towards Cheaper Steel.

In the struggle to maintain its existence in a period of world-wide depression and in face of fierce foreign competition, the iron and steel industry of Great Britain is forced to take stock of its present methods of manufacture and devise ways and means whereby greater efficiency can be obtained and economies effected in the cost of production.

Perhaps the most fruitful field for investigation is the more efficient utilization of the fuel made available and required in the various processes of iron and steel manufacture. It will be of interest, therefore, to learn of the steps which have recently been taken at the Normanby Park Steel-works of John Lysaght, Ltd., to achieve this object.

This is the first coke oven plant in this country to be heated with blast furnace gas. By the installation of this plant, the Company is enabled to produce a coke of such strength, uniformity of size, and combustibility that the whole of the production down to ¾ in. in size can be used in the blast furnaces, and yet less coke is required per ton of pig iron produced.

Because the coke ovens are designed so that they are heated efficiently with blast furnace gas, this low-quality fuel is utilized to better advantage than has hitherto been possible. At the same time the whole of the gas produced in the ovens in the process of coke manufacture is released for use in the steel-works.

This coke oven gas, which is of high thermal value, is giving better efficiency in the steel-works than is obtained by any other form of fuel. So nice a balance is obtained between the total heat produced and that used in the manufacture of coke, pig iron, and steel, that no fuel of any description is required other than the coal charged into the coke ovens.

The reduction effected by these means in cost of producing steel has already more than justified the capital expenditure involved. Thus John Lysaght, Ltd., have demonstrated how money wisely spent now can contribute very largely to the recovery of prosperity in perhaps the most important of the country's industries.

The New Installation of Becker Coke Ovens.

The installation consists of a battery of 47 Becker regenerative combination ovens. Each oven carbonizes approximately 14·1 tons of wet coal containing 10 p.ct. of water in 15½ hours, or 21·8 tons in 24 hours. Under these conditions, the whole battery is therefore easily capable of carbonizing 1020 tons of coal and producing therefrom over 670 tons of furnace coke per 24 hours.

The ovens are so designed that they can be heated either with coal gas or blast furnace gas. After being first started up on coal gas, they were changed over to blast furnace gas, and have since been operating with this gas as the heating medium. They are the first ovens in this country to be heated by this means.

The reversing valves controlling the supply of heating gas are so arranged that any chosen number of ovens can be heated by blast furnace gas while the remainder are heated by coke oven gas. The operation of changing over from one type of gas to the other is simple, and easily effected.

The blast furnace gas is obtained from the adjoining blast furnaces and is delivered to the plant with a dust content of less than 0·003 grain per c.ft. To safeguard the battery in the event of failure of the blast furnace gas supply, electrical control gear is provided so that when the gas pressure falls the reversing machine is automatically put into a neutral position and a Klaxon horn sounds a warning.

The oven brickwork from the pad upwards is constructed entirely of first-quality silica, excepting only the filling in the regenerators and the end walls adjacent to the pinion walls. The oven jambs, regenerator facings, and oven tops are insulated, the latter having a finish of paving bricks. The pinion walls at each end of the battery are constructed in concrete and provided with substantial wing walls. Firebrick-lined concrete waste gas flues are built along each side of the battery and connect into a single flue leading to the oven stack placed at one end of the battery. The stack is 250 ft. high, and is firebrick-lined for the first 50 ft.

As well as two hand-operated dampers an automatically operated stack damper is provided for regulating the draught.

The coal for the ovens is stored in a reinforced concrete bin having a capacity of 1200 tons of washed crushed coal. An electrically propelled coal charging car, with a total capacity of approximately 14½ tons of coal, runs on rails along the top of the battery. A scale of approximately 50 tons capacity is provided for weighing the coal in the car before charging, and is provided with ticket printing equipment for recording weights. A coal hoist, electrically

operated, is provided at the coal bin for retrieving coal withdrawn in the levelling operations and returning it to the coal charging car.

Heating System.

There are a series of vertical flues on each side of each oven, and two regenerators are built under each series of vertical flues.

When employing blast furnace gas as the heating medium, air travels up one of the two regenerators and gas up the other. Both the air and the gas enter the bottom of their respective regenerators from both ends of the oven at the same time. After passing through in an upward direction and absorbing heat from the chequer filling in transit, they leave the top of the regenerator and enter the bottom of the vertical flues through ports so designed in relation to each other that the air and gas come together with streamline effect, and the combustion zone is evenly distributed throughout the length of the vertical flues. The products of combustion are then collected from the top of each of four or five vertical flues and are carried over the top of the oven by means of cross-over flues.

There are six cross-over flues to each alternate oven, the intermediate ones not requiring any.

From these flues the waste gases are distributed into an equivalent number of vertical flues on the other side of the oven exactly opposite the flues up which they have travelled. They then travel down these flues and into the two regenerators immediately below, through which they pass to the waste gas flues, giving up heat to the chequer filling in transit.

Upon reversal, which is automatically controlled, the air and gas travel up through the regenerators and vertical flues down which waste gas has previously passed; the products of combustion travel through the cross-over flues and down the flues and regenerators on the opposite side of the oven up which air and gas have previously travelled.

This arrangement of heating ensures that the travel of gases throughout the system is short and unidirectional, and, consequently, there is a low-pressure differential and absence of leakage. The velocity of gases is slow and uniform, so that excellent regulation can be easily obtained.

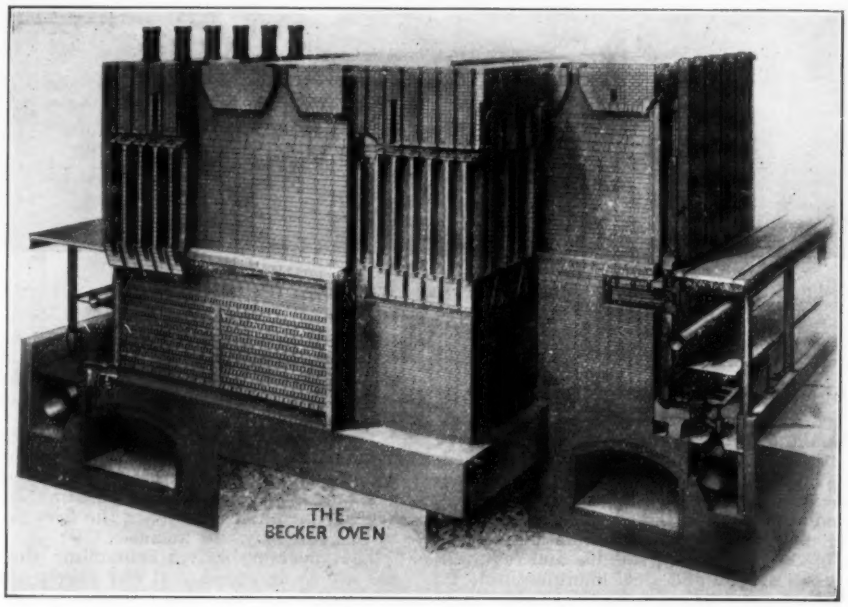
At all times and under all conditions the gas and air and combustion gases are flowing in parallel in an upward and vertical direction through the whole length of the regenerator and the oven flues on the one side, and the waste gases are flowing in a similar manner in a downward direction but on the opposite side of the oven. By this arrangement of flues walls containing no expansion joints can be employed for separating gas and air and waste gas.

Although, as in other types of oven, more gas is applied to the wider end than the narrower, in order to carbonize the varying width of coal charge in the shortest time, maximum efficiency of regeneration is obtained in the Becker system, because the quantity of heating gas and air at any point in the length of the oven takes up from the regenerator brickwork the heat which has been given to it by the waste gases from an equal quantity of air and gas mixture. By employing the principle of the cross-over flue a very strong form of construction is obtained, inasmuch as all horizontal flues or conduits are reduced to a minimum in number and in cross-sectional area.

The regenerators are so arranged that those in which blast furnace gas is being heated are never adjacent to those in which waste gas is flowing.

In actual fact two adjacent regenerators carry blast furnace gas and are flanked on either side by regenerator carrying air for combustion, so that each adjacent set of four regenerators carrying the fuel gas and air for combustion are under the same suction conditions. Conversely, the four adjacent regenerators on each side carry the waste gases, and thus the only walls on the sides of which counter-current flow occurs are those between regenerators carrying air and waste gas—namely, every fourth wall—and any danger of short-circuiting is eliminated.

When employing coke oven gas as the heating medium, air enters and travels up all the regenerators and the coke oven gas is delivered through a horizontal gas conduit carried in the brickwork between the top of the regenerators and the bottom of the vertical flues. From these conduits the gas passes by means of a calibrated nozzle and vertical duct into the bottom of each vertical flue, where it mixes with the preheated air coming from the regenerators. The flow of gases from this point onwards is the same as when blast furnace gas is used.



SECTIONAL VIEW OF BECKER COKE OVEN, SHOWING REGENERATORS, VERTICAL COMBUSTION FLUES, AND CROSS-OVER FLUES.

The air and blast furnace gas reversing valves or coal gas valves are automatically operated at the required intervals by a single machine, which is connected to the individual reversing valves by suitable mechanism.

Battery Control.

The reversing machine is placed in a control room at the end of the battery. The machine is normally operated by an electric motor, and a steam operated stand-by is provided which can be used in case of power failure.

The movements of the machine are controlled by an electric clock which can be set to operate the reversing mechanism at various time intervals. Should for any reason the clock fail to operate the mechanism at the predetermined time, within five minutes a water safety device causes the steam siren to blow.

Orifice type meters are provided for indicating, integrating, and recording the quantity of blast furnace gas or coke oven gas supplied to heat the ovens.

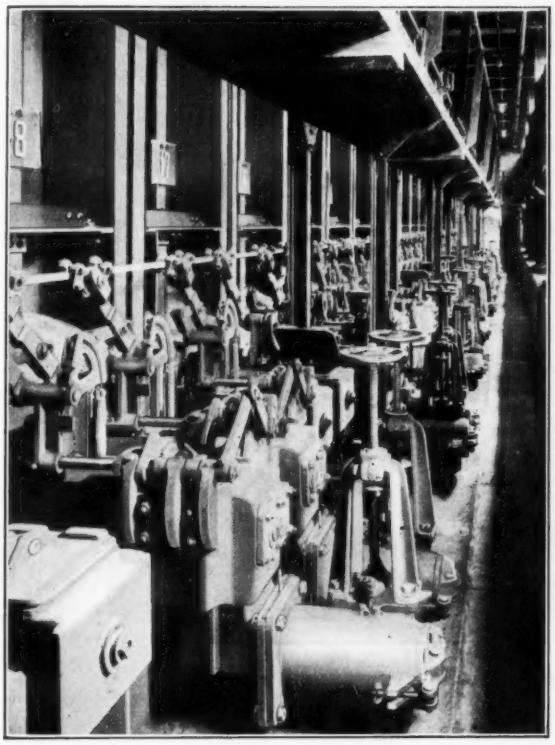
Coke Pushing.

When carbonization of the coal charge is complete, the coke is pushed by means of a pusher machine into a quenching car. The pusher machine, which runs on rails on a reinforced concrete platform along the full length of the battery, carries a ram which is built up of structural steel

with a cast-steel head. It also carries a rope-driven leveller bar to level coal in the ovens on charging, and a door ram to remove and replace the doors. The machine, pusher ram, leveller bar, and door ram are all operated by electric motors.

Coke Discharging Plant.

The coke is pushed into the quenching car, which has a capacity of approximately 10 tons of coke. It is hauled



Air and Blast Furnace Gas Reversing Valves.

by an electric locomotive on which a motor-driven air compressor is also mounted.

An electrically operated door lifting machine, running along a track on the coke side of the battery, removes and replaces the doors on this side. On the same side a coke guide, also running on rails and moved by the door machine, is provided for directing the coke, as it is pushed, into the quenching car.

The electrically operated clay carriers are provided to carry luting clay from a clay mixer, located under the coal bin, to the ovens, and to elevate clay at the oven doors. To ensure efficient luting of the doors and to facilitate operation, each machine is fitted with an electrically operated elevator provided with travel limit switches and safety device.

The quenching car, with its load of hot coke, runs into a central quenching station of the re-circulating type placed at the end of the battery, where it is sprayed with a pre-determined quantity of water.

After quenching, the coke is discharged on to an inclined wharf about 130 ft. long, running alongside the quenching car track. After cooling the coke is allowed to fall through hand-operated regulating finger type gates on to a 36-in. belt conveyor which carries it to the screening plant.

Coke Screening.

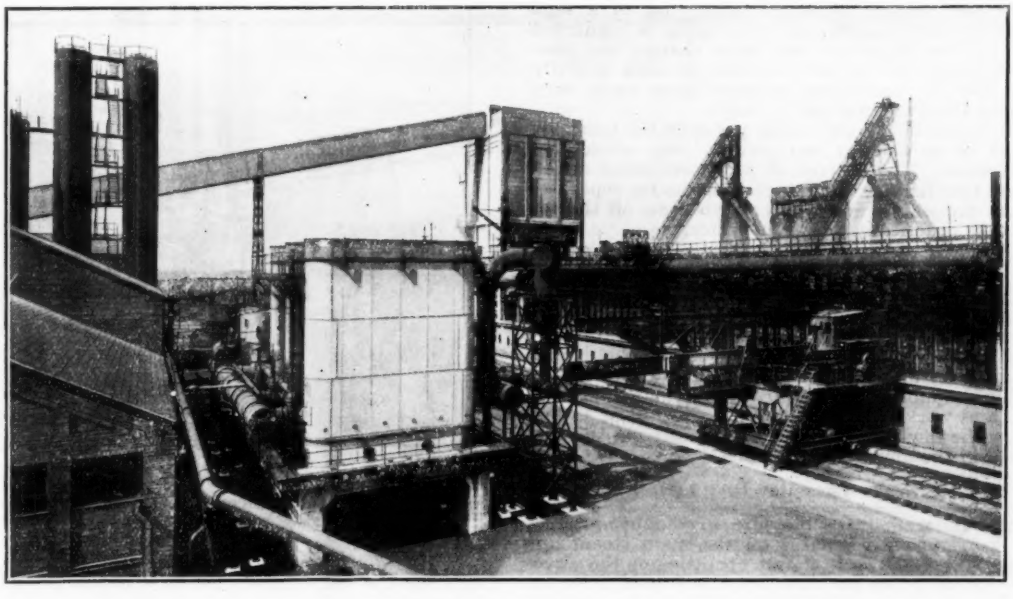
The conveyor delivers the coke through a chute into a double deck "Gyrex" screen capable of separating all the coke above 1½ in. in size and screening the remainder into two sizes—1½ in.-¾ in. and ¾ in.-0 in. The 1½ in.-¾ in. is re-mixed with the coke over 1½ in., and the whole of this material is carried by belt conveyors to the blast furnace storage bins. It has been found that the mechanical strength and combustibility of the coke are so good that approximately 95 p.ct. of the total coke produced can be used in the blast furnaces, leaving only 5 p.ct. as breeze, which is being used for heating purposes in other parts of the works.

Gas Collecting System.

The coke oven gas leaves the ovens through ascension pipes and passes into a steel gas collecting main. One ascension pipe lined with special insulating material is provided for each oven, and each pipe is fitted with a spray pipe for liquor flushing. Sprays are also provided on the main at alternate ovens. From the gas collecting main the gas passes into an offtake main supported on a steel bridge over the pusher track. The offtake main connects at the end of the bridge into a suction main which terminates at a downcomer before the primary coolers. The flushing liquor, which runs in a closed circuit, is returned at the downcomer to a liquor flushing and separating tank of capacity approximately 39,500 gallons. Two liquor flushing pumps, one electrically driven and the other steam turbine driven, are provided, one acting as a spare to the other. Special liquor strainers are placed after the pumps to prevent suspended matter reaching the sprays. An "Askania" gas pressure regulator, consisting of a butterfly valve in the offtake main controlled by a governor, regulates the pressure in the gas collecting main.

By-Product Recovery.

The process of ammonia recovery employed is the semi-direct system. The gas passes from the ovens to the primary coolers, which are of the indirect vertical water-cooled type. Two coolers are normally in operation, and one is provided as a stand-by. In these coolers tar and



VIEW OF PUSHER SIDE OF BATTERY, SHOWING PRIMARY COOLERS IN FOREGROUND AND BLAST FURNACES IN BACKGROUND.

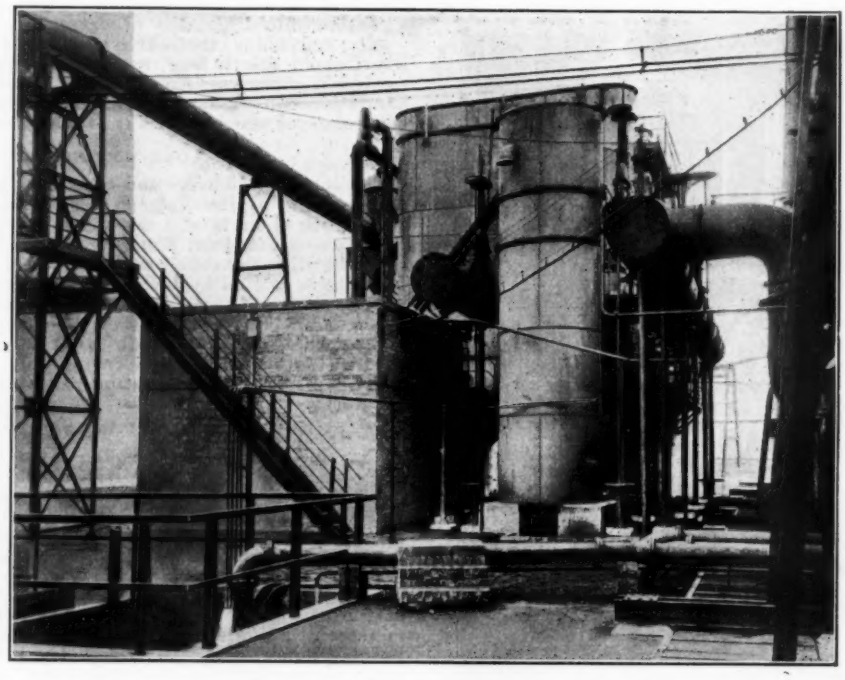
ammoniacal liquor are condensed. In order to maintain uniform temperature of the gas leaving the coolers automatic temperature controllers are provided, operating the water supply mains to each cooler.

Lodge-Cottrell De-Tarrers.

From the primary coolers the cooled gas is passed to two Lodge-Cottrell electrical tar precipitators each operated by a Lodge-Cottrell transformer set. The de-tarrers consist of a series of vertical tubes in cylindrical shells. The gas containing tar fog passes up these tubes, and is subjected to an electrical discharge emanating from the electrodes which hang down each tube. The particles on being charged are attracted to the pipes, and on reaching these pipe walls lose their charge and flow down continuously to the tar well below. The gas meets with no hindrance, and is itself unchanged by this treatment except that it is now clear of tar. Over 99·5 p.ct. of the tar contained in the cooled gas is actually being removed in the precipitators.

In an adjoining house two sets of electrical equipment (either of which is large enough for both de-tarrer units) convert the low voltage electrical supply up to a high voltage of some 60,000 volts, and this supply is conducted by cables into the de-tarrers and thus charges the electrodes to this high voltage so that they in turn electrify the gas. The tar and liquor mixture flows away very smoothly and steadily from the tar well.

This high degree of tar extraction prevents the tendency of the wash oil to thicken and gives a very white ammonium sulphate. The absence of any mechanical action upon the mixture has the advantage that the tar separates readily from the water, and it is easy to draw off the tar from the tanks practically free from water.



LODGE-COTTRELL ELECTRICAL TAR PRECIPITATORS AND TRANSFORMER HOUSE.

Exhausters.

Two single-stage Rateau turbo-exhausters are provided, each of which is capable of passing all the gas produced at the ovens and delivering it against a normal back-pressure of 2¼ lbs. when running at a speed of 8400 r.p.m. Each exhauster is direct-coupled to a Rateau multi-stage steam turbine capable of operating with steam at 100 lbs. per sq. in. and working against a back-pressure of 15 lbs. per sq. in. The low-pressure exhaust steam from the turbines is used in the ammonia and benzole stills.

Gas and Steam Pressure Regulation.

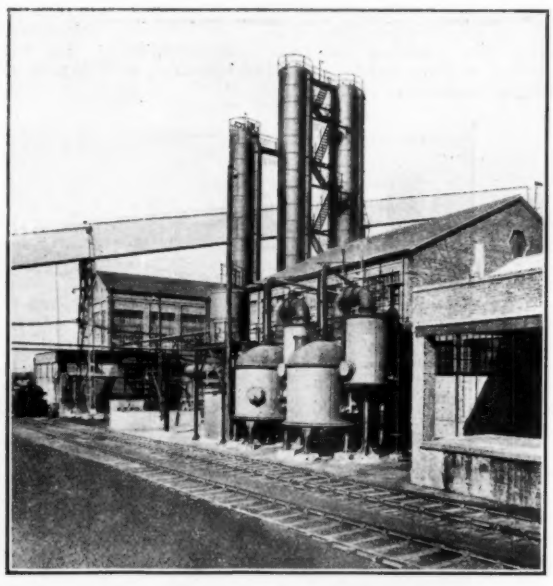
To ensure uniform steam pressure in the bye-product plant, an "Askania" regulator on the main steam line is provided. "Askania" regulators operating on the servo-motors of the exhauster turbines are also provided for regulating constant suction at the gas inlet to the primary coolers. They are provided with special overtaking gear to prevent hunting.

Ammonia Saturators.

From the exhausters the cooled gas is passed through a re-heater before entering the ammonia saturators, two of which are provided, one acting as a stand-by. The saturators and acid separators are placed in the open, and not in the sulphate house as has hitherto been the practice in this country, and in this way the size of the house is materially reduced, while repair and maintenance of the saturators and separators are facilitated.

For discharging the sulphate produced, each saturator is provided with a bronze salt ejector, which in turn is provided with a bronze fitted air separator for removing air from the wet sulphate before it enters the drain table, which consists of a lead lined cast-iron box.

After draining, the sulphate is dried in centrifuges, two of which are provided, each having a capacity of approxi-



Exterior View of Bye-Product Building and Sulphate Store,

Showing Outside Ammonia Saturators and Separators; also in foreground Sulphate Loading Platform, and in background Benzole Scrubbers and Final Cooler.

mately 600 lbs. of sulphate. The centrifuges are of the suspended, self-balancing type, driven by electric motors. From the centrifuges the sulphate is fed by a band conveyor into a Wilton drier, which dries and neutralizes the sulphate. The dry neutral sulphate is discharged into an elevator, which delivers it to a bagging hopper of 30 cwt. capacity, fitted with a weighing machine and a suitable gate for discharging into bags.

The ammonia condensate from the primary coolers is distilled in a still, situated in the same building as the benzole apparatus, so that these plants may both be under the charge of one operator. An orifice type meter is provided for measuring the ammonia liquor entering the still, which is also provided with a waste liquor trap.

Benzole Recovery.

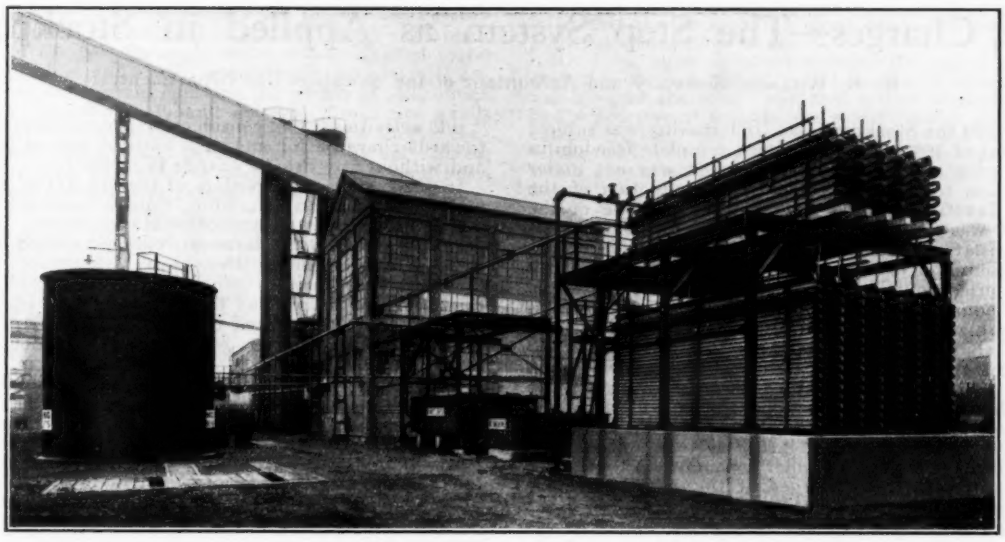
After leaving the bye-product recovery building, the gas passes through a hurdle type final cooler, where the naphthalene is removed. The cooler water passes to a naphthalene separating sump of 700 c.ft. working volume. After final cooling the gas is de-benzolized in two tower scrubbers 95 ft. high and packed with wooden hurdles. The gas passes up through the towers and meets a descending stream of wash-oil, which absorbs the crude benzole. The wash-oil enriched with benzole is delivered into a specially designed distilling apparatus provided with the necessary heat exchangers, condensers, and coolers.

The gas issuing from the second scrubber passes through an oil separator of the vertical downflow type, and through a venturi meter to a single lift gasholder of 100,000 c.ft. capacity. Thence it is distributed to the open hearth furnaces and other points in the steel-works, where it is being used for heating purposes.

Bought Coke Handling Plant.

A special handling plant has been installed capable of dealing with 85 wagons a day of coke bought from outside sources. The loaded side discharge wagons are brought on a gravity road to an electrically-driven cradle type side discharge wagon tippler, designed for a high lift on to a coke wharf. This coke wharf, which is 22 ft. long, is arranged alongside the main coke wharf and has a hoppered bottom arranged to feed through a finger bar type discharge gate on to the 36-in. main wharf conveyor belt. The gate is operated from the walkway serving the main wharf. The conveyor delivers the coke to the screening plant.

The entire bye-product coking installation was designed, erected, and put into operation by the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd.



GENERAL VIEW OF BENZOLE PLANT,

Showing Wash-Oil Cooler, Light Oil Cooler, Oil-to-Oil Heat Exchanger, Exterior of Benzole House, Tower Scrubbers, and Crude Benzole Storage Tanks.

Parliamentary Intelligence.

[From Our Special Correspondents.]

House of Lords.

The following Bills received the Royal Assent on July 12, 1932:

Gas Undertakings Bill, Kilmarnock Gas Order Confirmation Bill, Kettering Gas Bill, Commercial Gas Bill, Oakham Gas and Electricity Bill, Mid-Southern Utility Bill, South Suburban Gas Bill, Gas Light and Coke Company's Bill, and South Metropolian Gas Bill.

Special Orders.

The following Special Orders, having been passed by the Special Orders Committee, were approved by the House: Worksop; Oxford and District; Sheffield; Yeovil; Newbury; and Cambridge.

The Bath Gas Order has been postponed.

House of Commons.

Special Orders.

The following Special Orders have been approved: Worksop; Cambridge; Oxford and District; Sheffield; Yeovil; and Newbury.

Expenditure on Municipally-Owned Gas Undertakings.

Before the House rose for the Summer Recess, on Wednesday, July 13 last, an answer was given by the Parliamentary Secretary to the Board of Trade (Mr. Hore-Belisha) to a question asked by Sir Wilfrid Sugden in connection with expenditure on municipally-owned gas undertakings.

Sir Wilfrid Sugden asked if the instructions issued by the Government in 1929 as to expenditure on gas undertakings are still in force; whether it is the policy of the Government to encourage expenditure which does not add to the burden of the rates on the part of gas undertakings; and whether he will circularize local authorities as to the advisability of expanding the newer processes of gas undertakings which are becoming available through the results of recent research?

Mr. Hore-Belisha, in reply, said: I am unable to identify the instructions regarding expenditure to which my hon. friend refers, but I do not think it is necessary to remind gas undertakings of the desirability of adopting any new process designed to maintain or increase their efficiency.

THE "JOURNAL" TECHNICAL RECORD

Which contains Reports of Meetings of Gas and Allied Associations

Gas Charges—The Step System as Applied in Stockport*

By R. WILLACY, Secretary and Accountant of the Stockport Gas Department.

Prior to 1929 the Stockport Gas Undertaking was subject to an old Act of 1837 which permitted complete freedom in the charges for gas, also the Corporation was not under any obligation to supply. Upon the introduction of the Stockport Gas Order, 1929, practically the whole of the Act of 1837 was repealed, and Stockport now conforms to modern legislation. It is a maximum-price undertaking with a maximum of 13·3d. per therm, with power to charge additional prices outside the borough, declared calorific value 450, equal to 5s. per 1000 c.ft. This maximum is sufficiently high not to interfere with the prices and methods of charge under the old Act.

With the freedom of the 1837 Act the Council was able, when in a position to reduce the price of gas in 1924, to withhold the benefit of a reduction in price from unprofitable consumers. The object was attained by the introduction of what is known as the "step system" of charge, which requires that the whole consumption within a margin quantity shall be charged at the appropriate flat rate, and the whole consumption within each crescendo margin shall be charged at its appropriate flat rate, as distinct from charging varying blocks of consumptions each at its own rate, then adding the various sums together as under the block system.

This method avoids, in the first place, the very numerous calculations necessary in building up the block system, and, secondly, in subsequent calculations on the part of the staff and consumer, who may wish to check his account, while the revenue necessary is obtained from a similar average price per consumer.

The costs of the Department, including interest and sinking fund charges, were analyzed and divided under two headings:

Cost per consumer = Service charge.
Cost per 1000 c.ft. = Commodity charge.

Upon the publication by the National Gas Council of the Report of the Committee on Gas Charges, it was satisfactory to find that in total (differences in detail had balanced one another) the Stockport figures were confirmed by the Report.

From this dissection of costs a datum line was ascertained—that is, the quantity of gas which could be supplied without profit or loss, whether supplied on a flat rate or two-way method. The working costs of the Department have been improved during the intervening years.

The costs are dissected under two headings only, and the complicated debatable question of the effect of peak-load, &c., upon costs, which, in the Report, it is suggested should be recovered under the three and four way method of charge, is avoided, and the two-way is the underlying principle adopted.

With the method of recovery before you it has not been necessary to consider the alternative policies of basing the charge per consumer either on a flat rate per hereditament or a percentage on rateable value.

A charge is not made to the consumer for fixing, changing, or rent of meter, nor for time on complaints or maintenance. Costs under these headings are therefore included, and it will be seen the resultant figure of £1 13s. 4d. per consumer, or service charge, is treated as common to all consumers irrespective of quantity or situation.

The decision was made in 1923, when in a position to reduce the price of gas, only to grant relief to profitable consumers, instead of a flat-rate reduction to all, in accordance with common practice, and to establish for the ultimate object a maxim that all services of the Department should be at cost, cost to include profit.

This maxim is perhaps too ambitious for complete attainment, but is in operation in what may be termed "side activities," and considerable progress has been made towards charging for gas on a basis of cost of production, and without any drastic change in method.

In 1923, under the freedom of the old Act of 1837 previously mentioned, a minimum, though inadequate, charge was imposed upon all unprofitable consumers. The Stockport Gas Order, 1929, however, only permitted a stand-by charge to consumers who have a separate supply of "electricity, steam, or other form of energy;" therefore the minimum charge had to be dropped and in its place a stand-by charge required of small consumers of less than 5s. in value per quarter, who are not dependent upon gas alone.

This stand-by charge is not wholly an economic one, but has been fixed as an effective compromise, it being considered expedient to carry part of the loss of an uneconomic consumer to enable the Department to retain touch and goodwill in the hope of, at any rate, partial recovery in the use of gas in the future; and in fact this policy has proved about 20 p.ct. effective. Further, to force a material diminution in the number of consumers would increase the cost per consumer by reason of the reduced spreadover and the inability to reduce *pro rata* all standing charges.

Any fluctuation in revenue is to a great extent self-balancing, because should there be a falling-off in demand, production costs of the Department per 1000 c.ft. are increased, and in like manner the revenue figure per 1000 c.ft. on that consumption is also increased by operation of the steps, while an increase in demand would lead to cheapening production costs, and in proportion less revenue is needed and collected per 1000 c.ft.; and this self-balancing factor is claimed to be fair alike to the consumer and the Undertaking.

Of course, you need not be told that costs of production in September are greater, due to smaller throughput, than in March, when on our "peak" load; and you will appreciate that the consumers who cause this fluctuation in output foot the bill.

This self-balancing feature justified itself during the Coal Strike in 1926, which sorely tried the finances of other gas undertakings. Stockport, without any alteration whatever in the scale of charges, but through the elastic operation of the scale, earned its normal profit.

Attention is drawn to the high percentage of unprofitable consumers supplied in Stockport; and it would be interesting to know the proportion in other undertakings. For instance, 8867 out of a total of 16,150—in other words more than half the consumers in the Borough—in the September quarter, were supplied at less than cost, and even in March 6228 were supplied at a loss.

The gas sold in the nine years between 1914 and 1923 decreased by over 60 million c.ft. This decrease was steady from year to year. Then, under a new Chairman, commenced an energetic showroom policy, and the following nine years have shown a progressive improvement of over 280 million c.ft. in gas sold per annum. In 1924 the step system was introduced to a limited extent and as a shy experiment; then several maxims were adopted as objects for ultimate attainment, such as "supply all services at cost"—"quantity and not purpose to determine price."

By adopting the step system, though at that time (1924) Stockport was free to have adopted any method of charge, a scale was put into force which was in effect compulsory although it did not create any hardship or permit the consumer any alternative choice, therefore no uncertainty as to yield was introduced.

At this date the industrial scale was only merged so far as it was of benefit to the consumer. An improvement in working costs was reflected in a more favourable datum line which moved from 5000 to 4000 c.ft. per quarter. Therefore in 1927, on funds being available, the scale was arranged, to commence at 4000 c.ft. instead of 5000 c.ft.,

* From a paper at the Lancashire District Conference of the British Commercial Gas Association, June 29, 1932.

and extended to cover and give slightly better terms than the old industrial scale, and so consummate the maxim that "quantity and not purpose should govern price;" and in September, 1931, the scale was further extended to consumptions of 5 million c.ft. per quarter.

Prior to Jan. 1, 1930, and when working under the old Act, it was the practice to charge all consumers at the basic flat rate, and from that charge show on the invoice the deduction granted on quantity, according to scale. That was a somewhat laborious method of charge; and therefore, on the new Order coming into force on Jan. 1, 1930, a scale of charges of equivalent rates was introduced.

It does not come within the province of this Paper to review the relative efficiency of other theories, but I trust the major points in the history of the growth of the step system as applied in Stockport have been clearly explained. It has stood the test for eight years and is claimed to be simple, equitable, and easily understood; and you will appreciate that the system contains the germs of still closer relationship between costs and price as funds are available. Also, if new business should offer at a larger consumption, and outside the present scale, it is only necessary to determine the price at which it will be good business to negotiate and then extend the scale accordingly.

Discussion.

Mr. J. H. CLEGG (Burnley), moving a vote of thanks to Mr. Willacy, asked whether the alternative of the two-way charge was permitted. His own view was that any profits which accrued to a gas undertaking should be applied to the benefit of the more remunerative consumers. The "step" system in Burnley was not quite the same as that of Stockport, though in some respects it was a copy of it. The Burnley system applied equally to prepayment consumers as to ordinary consumers. The rebate took the form of a charge, which he understood was Mr. Willacy's idea of 1d. per therm of the whole of the gas consumed. The rebate was applied to prepayment consumers by ascertaining, at the end of the quarter, the amount which was due to the consumer, and the Borough Treasurer undertook the work of refunding the money to the consumer. The rebate was very valuable to the consumer for paying off instalments on his appliances. The amount of rebate, which had increased quarter by quarter, had shown that there was a tendency for this particular class of consumer to increase.

As a means of developing the "part" system of charge it had been decided to apply the method to industrial consumers only. The four-part, or multi-part, charge was considered to be necessary. He did not entirely agree that rebates on the price charged for gas should depend solely on the quantity of gas which was consumed, because the hours and period of consumption were particularly important. Probably Mr. Willacy would agree that a consumer who used 200 to 500 c.ft. per hour for 24 hours per day was a more valuable consumer to the undertaking than one who used 12,000 c.ft. in one hour. Therefore, a multi-part charge was necessary in order to deal with such variations in the use of gas. Burnley had been successful through the adoption of the four-part system of charge and the efforts made in promoting the sales of industrial appliances. They had introduced new business to the extent of 70 million c.ft. per annum, most of which had been obtained within the previous twelve months. During the past week he had recommended his Committee to adopt the two-part system for domestic consumers. The four-part system applied merely to industrial consumers and to such requirements as central heating.

It might be mentioned that there was very little opportunity in the case of most undertakings of adopting four-part charges unless the undertaking had a surplus of profits which it was prepared to disburse to the consumers of its products. The system adopted in Burnley was as simple as possible. A charge was made on the number of rooms in the house, having in mind that the fixed charges must have some relation to the potential consumption of gas.

Mr. F. G. SHAW (Buxton) seconded the vote of thanks. He said that the Gas Industry had to face a competitor which had adopted the most variegated system of charges possible, and which seemed to have the widest possible steps from one extreme to the other, whereas the price of gas did bear some relation to the cost of production. The new systems of charging which were coming into vogue in the Gas Industry would tend to meet that competition.

Mr. E. J. FOTTRELL (Joint Manager of the National Gas Council) thought that Mr. Willacy was particularly fortunate in his treatment of the subject of charges for gas, and it was certainly interesting to learn the results of the steps which had been taken. The increase in consumption certainly carried its own justification with it. Personally, he preferred the block system, but this was a minor consideration. Apparently, something like a saturation point had been reached within the limits which the flat system of charge imposed. At one end of the scale a revolution had been effected in the standard of comfort of the poorer classes of the community, while at the other end of the scale a luxurious service had been provided for those to whom the matter of expense was not of any great importance. In between those two categories of consumer there was an enormous scope for gas utilization. What was necessary to tap was the field of service represented by the 122 million tons of raw coal burnt. On the flat-rate system, or even on a flat-rate system progressing in steps, it would not be possible to undertake that load. In order to determine the flat rate for any particular demand it was necessary to make an analysis on the four-part basis, as Mr. Clegg had done. In making such an analysis for the purpose of arriving at a flat rate, surely it was much simpler to offer a two-part or three-part replacement allowance in the first instance. In regard to large-scale business, in respect of which the rates must be low and where the margin above the cost of production was small, mistakes could not be permitted as to the figure to be charged. The rate charged for such a load must be self-adjusting, and the only self-adjusting rate it was possible to offer was one based upon the nature of the demand. It was a national duty at the moment to undertake an investigation into such conditions.

Gas and Electricity in the Home: Illumination in Industry

[Extracts from papers at the Annual Congress of the Royal Sanitary Institute, Brighton, July 12]

The relative advantages of gas and electricity were discussed on Tuesday, July 12, at a conference of representatives of sanitary authorities held in connection with the 43rd Congress of the Royal Sanitary Institute at Brighton.

The Meeting was presided over by Alderman T. J. Braybon (Mayor of Brighton), who referred to an estate of 110 houses recently built on a central site, these houses being "all-electric" and 2s. 6d. per week being added to the rent for electrical fittings, &c. Current is supplied at ½d. per unit.

RELATIVE ADVANTAGES OF ELECTRICITY AND GAS FOR DOMESTIC USE: THE CASE FOR GAS.

By P. E. BROWNE, Distributing Engineer to the Brighton, Hove, and Worthing Gas Company.

The artisan municipal tenant, at any rate in the later estates, wherein the weekly rental demanded has been brought within the limit of possibility of payment by the people for whom the State-aided housing was intended, is definitely typical, largely, of the semi-skilled and unskilled labourer who, in good times, may be expected to earn from round about 50s. up to 60s. as a maximum per week.

What contribution to the problem of furnishing his domestic needs does gas make?

In the first place it is ordinary everyday custom, throughout the length and breadth of the land, for the Gas Industry, through the local suppliers of gas, whether company or municipally owned undertakings, to provide the initial capital necessary to be expended for the installation of gas meter, gas piping, gas cooker, gas-lighting fittings, and, in some cases, gas wash-copper and possibly one or more small gas fires for bedroom use.

In this manner not only does the housing authority effect a direct saving, but, beyond this, the prospective tenant is relieved of any need to make, for him, a comparatively heavy expenditure at a time when he requires every shilling at his command to pay his removal expenses and to allow for certain small re-furnishing needs which such removal entails.

He, on his part, through the agency of a penny-in-the-slot meter, recoups by degrees the providers of these installations by contributing a "differential" over and above the ruling price of gas, such "differential" providing the hiring rentals otherwise to be paid in addition to the standard price of gas by the hirer, for gas appliances installed by the undertakers.

In the Brighton area (where the price of gas is at present 9d. per therm. and penny-in-the-slot supply "differential" 2·8d. per therm, equivalent to 31 p.ct.), the average weekly collection from this class of customer approximates to 2s. 5d., and thousands of satisfied customers provide the whole of their artificial lighting, culinary, and hot-water needs for this sum, which, in addition to providing nearly 500 c.ft. of gas, covers the whole of the tenant's contribution towards the repayment of the capital provided and the

maintenance and renewal of plant, at an actual expenditure by him towards these costs of 1d. a day.

Gas, the refined essence of coal, provides the artisan's wife, at a price easily within her pocket, with a smokeless fuel which is absolutely under control and does not pollute the atmosphere. Given a moderately cheap abundant supply of gas, the artisan housewife will ask for nothing more to assist her in her domestic task.

Lighting.

In lighting, though it must be at once admitted gas is not so fashionable as its younger and very virile sister—electricity—yet the great talking point of the latter, the switch or distant control, has been available with gas for many years.

A great advance has recently been made with a cheap form of switch control, and further developments are at hand which will overcome the necessity for the perpetual by-pass or pilot light, which, it is believed, will make a renewed appeal to the housewife, as there is no question as to the comfort of gas lighting, the absence of glare, the softness of its diffused light, and the lack of any feeling of eye-strain, when either reading or writing, or doing even fine needlework in artificial light by its agency.

Domestic Heating.

For domestic warming, there is a wealth of choice of artistic gas fires of both the inset and the separate unit types; the great amount of research devoted to their development of recent years has resulted in a choice of apparatus, pleasing in appearance, scientifically designed, of a very high standard of hygienic attainment, silent in operation, and embodying a new type of radiant in which the infra-red ray is highly developed, for which reason medical opinion is largely satisfied that the warmth from gas fires fitted with this type of radiant, known as the "Beam," has a definite therapeutic value.

It is of interest, though, perhaps, somewhat of a digression, to record here an advance in a similar direction, by the introduction of the Radiation clinical gas lamp, designed primarily to develop an efficient and economical source of infra-red energy for use in hospitals and clinics.

As the lamp will shortly be marketed in a form suitable for use in the home, its benefits will soon be available in home nursing at trifling cost.

Cooking.

In cooking there have been many refinements introduced into the domestic gas cooking stove, which is now universally looked upon as an essential feature in home life, so that the enterprising speculative builder of to-day often includes a cooking stove in enamel finish as part of the equipment of the house, as an added inducement to its ready sale.

An advance of far-reaching importance is the new improved method of thermostatic regulation of oven gas consumption and heat control; the housewife, working to a simple chart, may, after the usual procedure of warming up her oven for ten minutes, and then placing therein the food to be cooked, set the dial of the thermostat or heat-controller to the appropriate number shown on the chart to correspond with the dishes to be cooked, which may comprise a complete dinner menu, and entirely dismiss it from her mind until the time to serve up ready for the table arrives.

Water Heating.

For domestic water-heating there are a number of appliances that may be economically employed, from the geyser or one-point heater over the bath, used in conjunction with its complement, a small thermostatically-governed boiler over the sink, to the gas-heated circulator coupled up to the hot-water system of the house for use independently of, or as an adjunct to, the coal range, or as a separate unit with its own hot-water storage cylinder.

A very great step forward has recently been taken by the introduction of several forms of highly efficient self-contained storage water heaters whereby the gas consumption is definitely limited to a small hourly rate, in order to restrict expenditure to a point within the means of every user.

Of course, the restriction of gas consumption itself governs the rate of ability to draw off hot water, but it may be said that the hot-water needs of a medium-sized villa may be adequately catered for at an expenditure of 6d. per day. To take an example from this area of supply: There was made recently a three-months' experiment in a small villa, metering both the water and gas used, and it was found that 38½ gallons of hot water was provided for an expenditure of 3¾d. a day, or 10 gallons of water raised to 130° Fahr. for each penny spent.

This figure would be improved upon in the summer months, as the experiment was conducted between the months of December and March, when the temperature of the incoming cold water was, of course, low.

To sum up, it is confidently submitted that were there no gas supply ready on tap, day and night, to furnish the many domestic needs for which it is such an admirable agent, the lot of the housewife would be rendered a more difficult and exacting task, and it would be hard, indeed, for her to find a substitute comparable in cost and ubiquity of service.

RELATIVE ADVANTAGES OF ELECTRICITY AND GAS FOR DOMESTIC USE: THE CASE FOR ELECTRICITY.

By W. N. C. Clinch, Engineer and Manager, Brighton Corporation Electricity Department.

A comprehensive comparison between gas and electricity is not possible, as the former is merely a means of conveying heat, whereas electricity is no substitute for gas, but is in itself natural energy comparable with no other, and is possible of ready conversion into heat or any other form of energy at an efficiency considerably higher than is possible with any similar application to which gas in its limited sphere can be applied.

Hygiene must be closely allied to electricity. For lighting purposes there is no better means than that afforded by by the electrical lamp. Electric lighting, contrary to illumination by gas, is obtained without flame, smoke, or, therefore, products of combustion, with the result that a much healthier atmosphere is maintained by its use.

For heating, whether applied to room heating, water heating, or heating for cooking purposes, electricity is unrivalled, because it can be converted into heat without combustion and the resultant products which give rise to so much difficulty and unconscious risks. Moreover, the utilization of electricity for producing heat is carried out at exceptionally high efficiency, as conversion gives rise to no waste products whatsoever.

Room Heating.—The heat provided by a radiant electric fire is obtainable without any reduction in the oxygen content of the air in the room, and ventilation of the room, for the normal purposes of the occupants, can be arranged without inducing a draught across the room to the fireplace, as must occur with a gas fire.

The flexibility of electricity, in addition to the pure heat made available by its use, presents an hygienic condition unobtainable by the use of gas.

Water Heating.—The use of electricity for this service requires little boost on this occasion, as the advantages are well known. The absence of any products of combustion does away with the necessity of providing an external vent, as is so essential with a gas heater (although this cannot always be arranged to be effective under all atmospheric conditions), enhances the hygienic conditions desirable, and must command the support, by recommendation and application, of an Institute such as this.

Cooking.—Consider for one moment exactly what occurs in a gas oven. For every cubic foot of gas burned in a gas oven, 8 c.ft. of air at atmospheric temperature are necessary for combustion or to maintain such combustion as will prevent an explosion, and suspended in this air is the dust arising as a result of the passage of the occupants of the kitchen. The air is possibly impregnated with other dust. This dust, some of which is burnt, is passed over the food which is being cooked, added to which, of course, that food is continuously in contact with the products of combustion arising from the burning of gas, together with the foreign matter (other than that present in the gas) to which reference has been made. The kitchen receives these resultant fumes, and the occupant inhales them during her presence in that room. The walls and furnishings retain the flocculent carbonaceous solids continuously ejected from the gas oven while in operation—a most unhealthy condition.

With an electric cooker no passage of air through the cooker is required, as pure heat only is utilized without any necessity for combustion of the heat-conveying medium.

Lunch in its entirety can be cooked electrically by the employment of pure heat without the contamination of products of combustion which must always be present with gas.

Hot water for the bath, heated electrically without any effort and without any risk of asphyxiation, is readily obtained. Clothes can be taken from the airing cupboard, kept at the requisite temperature at all times by means of electrical heater of very low wattage installed in these places.

Hygienic atmosphere and surroundings, together with

comfort, are available to those who live in a house in which electricity is used to the exclusion of gas.

There is no other form of energy available which renders to the public such a service as is made possible by the use of electricity.

Electricity in the Factory.

Let us now turn to industry in but a few words. How primitive would the modern factory be if the motive power desired were obtained by one or several gas engines erected around the building, with the numerous countershafts and other complications inseparable from such form of drive. Consider the ludicrous situation of a skilled mechanic working to close limits of accuracy by the aid of a gas light in close proximity to his work. The heat processes necessary in certain industries can always be carried out by the precise and accurate application which electricity makes available by means of muffle furnaces thermostatically controlled.

Cost and Operation.

The bogey of cost which is so often brought up, and is used to offset the hygienic advantages of electricity, is readily discounted in actual practice.

Dr. Margaret Fishenden, in a paper read before the World Power Conference, stated that the cost of cooking is about the same with electricity at 1d. per unit, gas at 10d. a therm, and coal at £2 per ton, without taking into account any of the savings or the enormous advantages by using the electrical method.

This condition is also found to apply to the other comparisons between electricity and gas.

Electricity is inseparable from the modern home, factory, office, hotel, place of entertainment, and transport; and comparison between gas and electricity does not arise therein. It is, of course, a matter of evolution. Not long ago, when talking to an old man, he referred to the considerable opposition with which the Gas Industry was confronted when it endeavoured to oust the coal range from the domestic kitchen—not without justification, as the lighting of a gas oven was then and is still a somewhat dangerous undertaking. Yet, despite this fact, gas for a time held its sway. Now the effect of evolution is leaving its mark. Gas cannot compete with the hygienic and sanitary methods now demanded and made available by the use of electricity.

The fact is, that electricity is not just a fuel which can be used as an alternative to gas, oil, or solid fuel, but is a different and unique method of providing heat and other services. There is no combustion and, therefore, there are no products of combustion. By its means heat or the other uses can be applied just where required with a greater efficiency than with any other method, with absolute cleanliness and safety.

Discussion.

Mr. A. E. McKenzie (Chief Electrical Engineer, Wimbledon) said there need be no hesitation in making Council houses all-electric on account of cost of operation where charges for supply were not more than 6d. for lighting, 1d. for cooking, and ¾d. for water heating. In Wimbledon the charges were 3½d. per unit for lighting, ¾d. for heating in the winter and ½d. in the summer, ½d. for cooking, and ¾d. for water heating in the winter and ½d. in the summer. The average cost per house with three or four bedrooms, two living rooms, kitchen, and usual offices was £14 17s., using electricity for all purposes. He suggested that Mr. Browne's figure of 1s. 10d. per week—after deducting 7d. for capital charges—as the weekly revenue from small property must be a genuine mistake, because from actual experience he himself had found it absolutely impossible to provide for all lighting, heating, and hot water requirements for such a figure, and quite frankly he could not credit the statement. Wimbledon nine years ago had no electric cookers, but there were to-day over 4000, or one to every six electricity consumers. Electric cookers were being installed at the rate of about fifteen per week; and if that progress were maintained it appeared that there would be no gas cookers left in Wimbledon in the near future. The great advantage of electric cooking was the absence of poisonous bye-products, which it was well known caused the headaches and lassitude inseparable from gas cooking. About two years ago one of the largest hospitals in Wimbledon was considerably extended, and after some trouble he induced the Governors to arrange the kitchen so that one-half was equipped for electric cooking and the other half for gas cooking. After twelve months no gas whatever was used and the gas range remained with a beautiful hood over it, which covered an area of 32½ sq. ft., apparently for the purpose of carrying off the fumes from the gas. Food electrically cooked was more appetising and retained the nutritious constituents lost in other forms of cooking. Moreover, house decorations lasted longer, an important point for Council landlords. With regard to water heating, electricity was advocated in Wimbledon exclusively for this purpose in the summer, while in the winter it was advocated in conjunction with a solid fuel fired boiler, thus doing away with the unhealthy or dangerous gas heater with its expensive but necessary vent. Little space was required for electric water heaters and no extra space at all in the case of immersion heaters. An immersion heater of 2 kw. capacity in a 25-gallon tank would raise the water 100° Fahr. at a cost of 4d. with current at ½d. per unit. As regards room heating electricity was unsurpassed for occasional heating, and there was no need to "promote ventilation"—the catch phrase of gas. He suggested that the condition of flowers in an electrically heated room was very different from that in a gas heated room, and he had found that, whereas flowers would last for a week in a room electrically heated, they very often did not last 24 hours, and certainly never more than 48 hours, in a gas heated room. Carbon monoxide was heavier than air, and as very often children were playing on the floor of a kitchen where food was being cooked by gas or the room was heated by gas, these children must be inhaling the poisonous carbon monoxide fumes. Finally, Mr. McKenzie said that as the public authority was the custodian of the health of the community within its borders, and rightly insisted on up-to-date and approved sanitation, &c., it was consistent that local authorities should insist, as far as possible, that the homes of the people should be electrified, thus putting the keystone to the efforts of the local authorities to safeguard the health and general welfare of the community, bearing in mind the cardinal fact that the women, who are the mothers of the nation, spend the greater part of their lives in the kitchen. Wimbledon was well known as a healthy borough; and probably one of the chief contributory causes to this was the fact that 85 p.ct. of the houses in that district are electrified.

Mrs. M. A. Cloudesley Brereton, asked by the Chairman to speak, said that as a Fellow of the Institute she always refused to enter into a controversial discussion of this kind.

Gas versus Electricity at Woolwich.

Mr. V. W. Dale (Electrical Development Association) said Mr. Browne's paper rather inferred that the Gas Industry had a monopoly in providing light, heat, and power in artisan dwellings; but that was far from the fact, nor was it the fact, as indicated in the paper, that if a supply of gas was not available it was necessary to adopt the coal range and the oil lamp. Information had already been given to the meeting with regard to Wimbledon, and there were a number of other typical examples which might be mentioned. For instance, in Woolwich there was an estate of 2171 houses, and in from 800 to 900 of them there were no fires apart from a coke boiler. The remainder had 1, 2, or 3 fires. The rents varied from 11s. to 15s. 6d. per week, the average cost of construction of these houses being £470. The average income of the tenants was from £2 15s. to £3 10s. per week, and the average price for electricity, including lighting fittings and cooker, was ¾d. per unit. The highest consumption was 10,000 units per annum, which might seem a large quantity, but it represented the use of electricity for all purposes; and in such a case the actual bill was just over £20. A new estate was now being developed, the houses costing £400. The charges for electricity were a primary charge of 16s. per quarter or 1s. 3d. per week, and a running charge of ½d. per unit for all purposes. The electric cooker was hired at from 5d. to 7d. per week, and in open competition with gas the Electricity Department had secured about 60 p.ct. of the houses. This new estate was also in Woolwich.

In Manchester there was an estate of 58 houses in which electricity was used for lighting, ironing, a wash-boiler, bedroom heating, and cooking. The lowest consumption was 708 units per annum and the highest 4349. The lowest bill was £4 4s. 2d. and the highest £12 9s. 3d., the average consumption being 1832 units and the average cost per annum £7 2s. 11½d. All these tenants were completely satisfied, and there was a growing demand in the district for "electric houses." In a similar way in Birmingham in middle-class houses using electricity for lighting, cooking, two kettles, two radiators, iron, curling tongs, fan vacuum cleaner, immersion heater, wireless receiver, hotplate, hair dryer, and battery charger there was a total consumption of 8765 units, and with a tariff of £2 per annum plus ¾d. per unit in the winter and ½d. in the summer, the total cost was £27 per annum, including hire charge for cooker and only half-a-ton of coal.

Again, as refuting the suggestion in Mr. Browne's paper that the Gas Industry alone assisted its consumers in regard to fitting up their premises, it could be said that there are over 300 electrical undertakings in which assisted wiring schemes and hire and hire purchase schemes are in operation.

Proof of the Pudding.

Mr. W. H. Becket (Gas Light and Coke Company), dealing with Mr. Dale's suggestion that the figures mentioned by Mr. Browne of the revenue from small houses were inaccurate, said that the Gas Light and Coke Company had 750,000 artisan consumers and the average consumption was only 22,000 c.ft. per annum, yet Mr. Dale had suggested 1000 c.ft. per week for the cooker only. Perhaps this was sufficient answer to Mr. Dale's criticism. There had recently been an instance in Fulham which gave a very good insight into what the artisan really wanted. It had been decided that electricity only should be installed in the new flats known as Fulham Court, erected by the Fulham Borough Council, but saner counsels eventually prevailed and it was decided to install both gas and electricity and to give the consumer a free choice, the gas and electricity authorities putting their case in their own way to the householders. As a result 86 p.ct. of the in-coming tenants selected gas for cooking, 81 p.ct. selected gas coppers, 68 p.ct. selected gas heaters, and 45 p.ct. selected gas irons. Figures had been given of housing estates in which the revenue was from £14 per annum upwards, and he was wondering what class of tenants occupied these houses; because in the whole of the Gas Light and Coke Company's area, which extended from Windsor to Southend, the

average revenue from small property did not exceed £4 per annum for all the services mentioned. He, therefore, suggested that in the case of the artisan dwellings which had been referred to the tenants had been forced into using electricity and into paying much more than they could afford.

Speaking on the trend of the discussion Mr. Becket said it was not the common practice of the Gas Industry in these discussions to say anything anti-electric. The policy was to be pro-gas and to leave the other man to look after his own job. When, however, such statements were made that children were living in an atmosphere of carbon monoxide he felt forced into the position of asking whether the electrical people really knew what they were talking about. The only other remark he wished to make was that on housing estates where electricity was not available there was no likelihood of the tenants complaining of the service rendered by gas.

"A Gross Exaggeration."

Mr. C. F. Botley (Chief Engineer, Hastings and St. Leonards Gas Company) said that as a visitor by the courtesy of the Institute he found himself in some difficulty in being drawn into a debate which had unfortunately been made so controversial by the manner in which those on the electrical side had dealt with it. On behalf of the Gas Industry, however, he wished to point out that scientific research had been going on for many years, and that such a state of affairs as had been suggested by the electrical people would not be permitted for one moment. The suggestions by the electrical people as to the harmful effects of gas were a gross exaggeration, and were indeed repudiated by everyday experience in thousands of homes. It was perfectly true that gas apparatus must be suitably fitted, but to suggest that there would be sufficient carbon monoxide in a room to be a serious detriment to health was going a bit too far. If that had been the fact, what would have happened to all the women who had been using gas for cooking for so many years? They would all have been poisoned by now. As a matter of fact, however, the health of the people had improved as the use of gas had increased. If electrical appliances were not properly fitted they knew what the result was likely to be. Therefore, it was unfortunate that the discussion had taken the tone it had, because the Gas Industry had great admiration for electricity. Personally he had been handling it alongside with gas for forty years, but was careful to use the most suitable agent for a particular purpose; and certainly electricity was not the agent from which to get heat in its best form.

Miss Howard said that although she was an enthusiast for electricity, and had had considerable experience of it in Canada, she had found in London, in connection with the conversion of flats, that on the question of cost and time of heating, electricity did not compare with gas. For instance, she had found it necessary to put in gas rings to get quick boiling. Although her sympathies were with electricity, she felt compelled to install gas for many purposes in a new house which she was moving into very shortly.

Alderman Mattison (Middlesbrough) expressed regret that such antagonistic views as between gas and electricity should have been advanced. In Middlesbrough there was a Gas and Electricity Committee which made the best use of the two commodities for the purposes for which they were most suited. For instance, electricity was better than gas for lighting, and, of course, the electric iron was a great advantage in any home. On the other hand there were purposes for which gas was more suitable than electricity. In these circumstances there should be no opposition between the two, but they should work amicably together in order to get the best out of them in their own particular spheres.

Reply by Mr. Clinch.

Mr. Clinch in a brief reply to the discussion said that, although there was healthy competition between gas and electricity in Brighton, there was also considerable understanding between those in charge of the two undertakings. Referring to Mr. Becket's remarks, he said that comparisons could only be made in like circumstances in relation to the price per therm and the price per unit. Instances had been mentioned of tenants having a free choice of gas or electricity; and another was at Rottingdean, where out of 32 houses 30 were all-electric. With regard to gas coppers he called attention to a circular issued by the Ministry of Health. It appeared that there had been cases of sickness brought about by the presence of carbon monoxide (to which, however, he had made no reference in the paper), due presumably to the gas pressure varying. There had been cases in which for some reason the air inlet had been restricted. The vent discharged into the room, which had resulted in a degree of poisoning, presumably by carbon monoxide. In reply to Miss Howard, he said he could only suggest that there was something wrong with the apparatus in her case, and he agreed that it was difficult to support sentimentally anything which did not give satisfaction in service. It certainly was not sentiment which caused the people in Brighton to adopt electric lighting, electric cookers, electric water heaters, &c.; it was the definite fact that electricity for all purposes was cheaper, safer, and more satisfactory than gas.

Mr. Browne's Reply.

Mr. Browne, who also briefly replied, said he had hoped to listen with great pleasure and some profit to a treatise by Mr. Clinch on the advantages of electricity; but he certainly was not content to sit at the feet of Mr. Clinch and allow him to arrogate to himself knowledge on the technique of the combustion of gas which the paper had demonstrated Mr. Clinch did not possess. He also took exception to the red herring, which the electrical people were always drawing across the trail, concerning the products of combustion. A great deal of scientific research had been carried out on this question for many years. The Gas Industry had been trading for over a hundred years quite successfully, and it was not dead yet; and this applied to the Industry not only in this country but all over the world. The products of combustion consisted largely of CO_2 and water vapour, both of them harmless. In connection with the gas oven there was a current of air constantly passing over the food being cooked, and the conditions set out by Mr. Clinch simply did not, in fact, exist. As to housing estates, he maintained that where the tenants adopted electricity to the extent that had been mentioned, in many cases it was under compulsion and sentiment did not enter into it. He made that statement without hesitation. In the case of the Rottingdean estate that had been mentioned by Mr. Clinch, the Brighton Electricity Department or the Housing Committee provided electrical appliances throughout free and gratis. Was that competition, was it sentiment? No, it was compulsion. In reply to Mr. McKenzie's criticism of the 1s. 10d. per week—after deducting 7d. for fittings—the figure was taken quite accurately from the books of his Company. As to the life of flowers, all he could say was that in his house with gas they lasted for a week, and he did not think there was very much in that point. Reverting again to the question of CO, he emphasized the point that this is not a product of combustion but a product of incomplete combustion; but in any case it was infinitesimal.

A cordial vote of thanks was passed to both authors at the conclusion of the discussion.

ILLUMINATION IN INDUSTRY.

By W. J. Jones, M.Sc., A.M.I.E.E., Manager of the Lighting Service Bureau.

It is now generally recognized by competent authorities that adequate illumination represents an important factor in industry, and should rank equally in importance with ventilation and heating in the study of industrial hygiene.

While in many progressive factories the subject of lighting has been given its due place, there is still a lamentable tendency on the part of most industrial executives to consider lighting as an expense which should be borne grudgingly. On investigation this view can hardly be substantiated, since lighting has an important bearing on both the well-being of the worker and the over-all efficiency of the plant.

There is now ample evidence that good lighting increases the output of work, is an important factor in maintaining quality, and, as a factory inspector recently indicated, improves the morale and reduces the fatigue of the operative.

A high standard of lighting permits the eye to see quickly, and the small interval of time saved on each operation carried out under good lighting results in a greater output of work; this fact is borne out by the experiments of physicists in vision testing, Government departments in industrial experiments, and progressive industrial concerns in trial installations.

Apart from the carefully controlled tests in such work as typesetting and weaving, where the tests have been carried out by official bodies, reports are available from many sections of the industry, both in this country and abroad, indicating to what a remarkable extent a high standard of lighting has an economic value through improved production.

Even in the industrial conditions prevalent in foundries and tile-making by hand, where the visual task is apparently less severe, recent reports of H.M. Inspector of Factories have shown that in the former case the operatives were able to earn a substantial bonus on the improvement of the lighting from 2 foot-candles to 7 foot-candles, and in the case of the tile-making, where the illumination, formerly poor and patchy, was replaced by general and local lighting of 3 to 4 foot-candles, the effective production was increased by 6 p.ct.

In such cases, perhaps for want of more exact information, it would appear that the more cheerful conditions under better lighting provide a stimulus to better working.

Economics of Good Lighting.

A study of the economic situation is important, since in most factories the cost of lighting represents less than 1 p.ct. of the wages bill, and hence the value of a very small increase in output brought about by better lighting will amply meet any additional lighting cost. In the case of typesetting, it has been estimated that by increasing the illumination from 2 to 20 foot-candles the output was increased by 33⅓ p.ct., and that the value of this output at ordinary trade union rates was sufficient to meet the cost of the extra light some twenty times over.

While some modern factories in this country are already lighted in accordance with modern standards of illumination, recent surveys indicate that the bulk of the lighting in factories is far from satisfactory. For example, a recent survey of lighting in the Midlands by an inspector of factories reveals the fact that many factories are work-

ing with very low values of illumination. This is shown in tabular form below. The inspector found that 60 p.ct. of the power presses inspected were provided with less than 2 foot-candles. Bearing in mind the hazardous nature of this work, it will be generally admitted that this low standard of lighting is a factor in the high accident rate in connection with machines of this character.

Operation.	Percentage Shops with less than 5 Foot Candles Illumination.
Lighting engineering—	
Precision grinding	22
Assembling	40
Fitting and fine bench work	44
Packing	86
Wireless apparatus –	
Fine assembling	41
Fine turning	33
Fine coil winding	10
Clerical work	90
Ironfounding—	
Moulding by hand	90
Silversmiths –	
General bench work	49

Apart from the question of the installation, a great improvement could be made in the lighting of factories by an organized system of maintenance. It is found that dirt and dust are frequently responsible for a loss of 40 p.ct. of the light emitted by the lamp, and one would suggest that in a factory of any size those responsible for the maintenance should be provided with a portable photometer, so that a careful check can be made of the conditions prevailing.

Recommended Illumination Values for Industrial Processes.

	Foot-Candles Recommended.
Offices—general	12
Drawing offices	25–50
Foundries—rough moulding	8
Assembly shops—rough	8
Machine shops—medium work	10
Sewing—light goods	12
,, dark goods	25–50
Laundries and dry cleaning	12
Warehouses	3

Conclusions.

Gloom and glare are the twin defects of most artificial lighting installations. Gloomy surroundings have a profound psychological effect on the workers and are a handicap on the maintenance of good discipline and cheerful activity, and, further, it will be noted that the lighting intensities only too common at the present time are so low that the worker is handicapped as far as visual acuity is concerned by as much as 50 p.ct.

I would therefore suggest that this conference should take every opportunity of stressing the importance of industrial lighting in its effect on industrial hygiene, and to that end would suggest that a knowledge of artificial lighting is essential to anyone engaged in hygiene and sanitation, and that the subject should be included in the curriculum for the study of medical officers of health and welfare workers.

I would also suggest that this conference endorses the resolution adopted by the International Commission on Illumination in September last, that the question of satisfactory artificial illumination should be considered as an important element in promoting industrial hygiene.

Nerve Strain and A.C.

Mr. Robert Fulcher, writing to "The Electrical Times," says:

"I am definitely of the opinion that another source of nervous strain can be attributed to the effect of electric lighting supplied from a.c. mains. It is well known that when the fingers (or any comparatively thin objects) are moved slowly before the eyes a peculiar effect is noticed which one can surely imagine is harmful to the nerves. I mention this because I have recently been asked by people whose electrical supply has been changed from d.c. to a.c., if there is really any difference in the nature of the light, as they say it is only recently they have been 'nervy.' Of course, it is not a question for an engineer or oculist, but I am sure that there is something in it, and it will be years, perhaps, before the truth is realized."

STANTON
DELAVAUD
Spun Iron Pipes
3, 4, 5 and 6 Yards Long
STANTON SPUN 6 YARDS LONG
STANTON SPUN 5 YARDS LONG
STANTON SPUN 4 YARDS LONG
STANTON SPUN 3 YARDS LONG
The Stanton Ironworks Company Limited Nr. Nottingham

Corporation Undertakings' Results.

Bangor (Caernarvonshire).

On the past year's working of the Bangor Gas Department there has been a net loss of £341, as compared with the net surplus of £59 for the previous year. This loss of £341 was after a very substantial credit of £849 in respect of income-tax which was recovered after negotiations with the Inspector of Taxes; hence had they been paying income-tax comparable to previous years the net deficiency would have been approximately £1190. This result was due to a serious loss of revenue consequent on a reduction in output of gas sold and to being unable to make a *pro rata* reduction in working costs. There was also a slight increase in capital charges on interest and sinking fund. Sales of coke were 125 tons less than the previous year, and the price per ton had fallen by 3s. 6d. per ton.

Heywood.

The balance-sheet, as prepared and presented by the Borough Treasurer, shows that the gross revenue amounted to £32,950 and the gross expenditure (less interest and sinking fund) to £23,137, leaving a gross profit of £9813, and, including £8603 interest and sinking fund, a net profit of £1209, as against a loss last year of £102. The total capital expended during the year amounted to £1057, made up of £931 on prepayment meters and £125 for cast-iron main. The total quantity of gas manufactured was 691,600·5 therms, of which 37,350 therms was carburetted water gas. During the year 8087 tons of coal have been carbonized, giving an average make per ton of 80·90 therms, against 80·83 therms last year. The total sales of gas amounted to 607,847·84 therms, an increase over 1931 of 0·02 p.ct. The increase in the figure of " gas unaccounted-for " from 9·91 p.ct. to 10·56 p.ct. is largely attributable to the serious leakage which took place on the several occasions during the year when the 9-in. diameter main was fractured in Mine Street after the sewering operations were completed. During the period under review 310 consumers' services and 28 public lamp services had been renewed in addition to the laying of 90 new services to consumers and the examining of 139 other services.

Leicester.

The new gasholder at Aylestone Road Works was brought into use during the year. The gasholder and No. 3 section of the works were formally inspected on Sept. 2. Air signs were painted on the crowns of one of the gasholders at each of the works, and local airmen have expressed their appreciation of this innovation. There were laid during the year rather over 14 miles of main pipes, and at the same time the very heavy alterations to the trunk mains in connection with the street improvements scheme have been completed. New consumers numbering 1229 were connected to the mains, the total number at the end of March being 81,445. There were 6719 new gas appliances of all sorts supplied by the Department during the year. The total expenditure on revenue account was £432,053, compared with £444,660 in the year 1930-31. Coal, oil, and coke for the manufacture of gas cost £170,540, a lower figure than last year by £4683. The total quantity of coal and its equivalent was 153,696 tons, against 159,265 tons used in the preceding year. The cost of coal per ton was rather over that of 1930-31. The total receipts amounted to £563,271, and are less than those of last year by £31,063. Gas sold produced £485,423, compared with £510,013 last year, the reduction in price and the reduced output accounting for this. The balance from revenue account is £131,218, compared with £149,674 in 1930-31. After adding sundry interest credited amounting to £2387, the total credit to net revenue account is £133,605. The charges against this account are for interest and sinking fund £89,319, income-tax £26,562, and depreciation of meters £6978, amounting altogether to the sum of £122,859, and there is a net profit of £10,746. After adjusting income-tax computations for the years 1921-22 to 1929-30, there is a sum of £21,705 appearing in the balance-sheet, which is available for allocation. The gas sent out from the works was 2,675,848,000 c.ft. and the gas sold was 2,635,633,238 c.ft., leaving 40,214,762 c.ft. unaccounted-for, or 1·50 p.ct., as compared with 1·72 p.ct. last year. The gas made was 17,434 c.ft. per ton of coal carbonized, and the sale was 17,148 c.ft. per ton.

Macclesfield.

There has been an increase in the consumption of gas amounting to 36,789 therms, which is 2·32 p.ct. above last year's figures. The prepayment system now amounts to 49·90 p.ct. of the whole consumption, and shows an increase of 4·54 p.ct. above last year's consumption. The total quantity of gas sold during the year was:

Therms.

Ordinary.	Prepayment.	Public Lamps.	Total.	Increase.
736,707	808,287	74,579	1,619,573	50,579

The average price for all gas supplied amounts to 5·631d. per therm net. After paying £3638 towards the interest and sinking fund, the net profit for the year was £987. The number of cookers, gas fires, radiators, boilers, &c., sold or let out on hire purchase during the year was 756, against 710 last year. During the year 110 new service pipes were laid and new meters fixed; the total number of meters in use at the end of the year being 10,772, an increase of 77 on the previous year.

Sedgley.

The annual report of the Gas Committee of the Sedgley Urban Council states that the net profits on the year's working were £1241, out of which a capital expenditure of £859 had been paid. The working balance carried forward was £6389. Figures given in the report show that during the year ended March 31, 1932, 67,270,100 c.ft. of gas were accounted for and 10,346,900 c.ft. were unaccounted for. Councillor Pratt, the Chairman of the Gas Committee, stated that the latter figure would be closely inquired into, and it was hoped to reduce it to normal proportions. The Ministry of Health have sanctioned the borrowing of £9500 for the acquisition of land and the erection of a new gasholder.

Stourbridge.

The sales of gas by ordinary and prepayment meters show reductions amounting to 4 million c.ft., due to trade depression and abnormal weather conditions. The public lighting consumption remained stationary. The gas unaccounted for also remained about the same. The revenue account expenses are normal, rates and taxes showing a satisfactory reduction. The income from the sale of gas has decreased by about £528. Meter and stove rentals continue to increase. Coke prices have been stationary during the year, but as the yield per ton of coal has been greater, there has been a less tonnage of coke available for sale. The revenue from tar is reduced by over £1200, the sales having been very small. The bad weather of last summer and the Government economy campaign caused the surveyors to reduce their tar painting programmes very materially. The loss on sulphate of ammonia was substantially reduced. The gross profit is £19,330, being a decrease of £1213. The balance from revenue account is subject to the usual deductions for income-tax, annual instalments, expenditure on mains, services, &c., and the surplus, after these deductions, is £2155, a decrease of £1068. Special repairs were necessary on the tar dehydration plant, which has been brought into first-class condition.

Workington.

The gas produced during the year amounted to 189,777,000 c.ft (816,800 therms), an increase of 4·52 p.ct. over the previous year. This output of gas is a record for the undertaking. The gas produced per ton of coal carbonized was 20,195 c.ft., equivalent to 86·91 therms, the gas sold per ton of coal carbonized being 18,967 c.ft., or 81·56 therms. The results for the year show a net profit of £1150, against a net profit of £1151 for the previous year. During the year under review the Harrington Urban District Council were supplied with gas in bulk. The supply was connected on Aug. 19 last, and from that date to the end of the financial year 8,744,300 c.ft. of gas had been delivered. The length of new mains laid during the year was 2·18 miles, which includes the high-pressure extension to Harrington. The total length of mains laid to date is 33 miles.

Register of Patents

Gas-Heated Furnaces for Dentistry. No. 374,288.

Joos, P., of Stuttgart.

No. 17,827; June 19, 1931. Convention date, June 20, 1930.

A rotary gas-heated furnace more particularly adapted for use in dentistry for annealing, soldering, melting of metals, and burning of porcelain and the like, characterized in that a spherical three-part heating vessel rests on ball or roller bearings, whereas the divided upper part is arranged to fold down towards both sides, so that annealing, soldering, and melting work can be carried out conveniently from any side.

Gas Main Stoppers.—No. 374,649.

Pass, E., of Denton.

No. 18,836; June 30, 1931.

This invention concerns stoppers comprising a rubber diaphragm which can be introduced through a hole into a gas main, the diaphragm being caused to assume the shape of the bore of the main, by acting upon collapsible flexible springs combined with the diaphragm.

A difficulty arises, even when the stopper is well fitted in the main, to prevent the passage of gas from one side to the other, because the gas is apt to find passage way via the point of attachment of the rubber diaphragm about the neck-like connection to the operating means, which occupy a position near the base of the screwed-in cylindrical or like housing when the rubber stopper or diaphragm is supposed to be completely closing the bore.

The invention seeks to overcome the objection. A rubber diaphragm is used, preferably a moulded one of some width, and a flexible and hinged metallic expander is used, the rubber diaphragm being moulded or fitted with a substantial neck. This neck fits a corresponding cavity in the base of a plunger-like device accommodated within a cylindrical housing attachable to the main. This plunger-like device comprises an inverted cup-shaped packing ring capable of ensuring a gas-tight fit to the bore of the cylindrical housing.

Presuming the apparatus is properly applied to the main, then the plunger-like device and combined neck of the rubber stopper or diaphragm present an impassable and gas-tight barrier against the passage of gas.

STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

[For Stock Market Report, see later pages.]

Issue	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. July 16 (Provincial Exchanges July 15.)	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
1,551,868	Stk.	Apl. 4	7⅞	7⅞	Alliance & Dublin Ord. ...	110—120	−5	117½
374,000	,,	July 4	4	4	Do. 4 p.c. Deb. ...	78—83*	...	...
557,655	,,	Mar. 14	7	7	Barnet Ord. 7 p.c.	135—145	+2½	...
300,000	1	Apl. 29	1/4⅛	1/9⅜	Bombay, Ltd.	15/—20/-	...	18/6—19/6
177,750	Stk.	Feb. 29	9	9	Bournemouth sliding scale	180—190	+5	180—189
550,050	,,	,,	7	7	Do. 7 p.c. max. ...	137—147	+2	...
439,160	,,	,,	6	6	Do. 6 p.c. Pref. ...	125—130	+2½	...
50,000	,,	June 20	3	3	Do. 3 p.c. Deb. ...	70—75	...	...
162,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	90—95	...	...
210,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	115—120	...	...
					Brighton, Hove, & Worthing			
357,900	,,	Mar. 14	7½	7½	6 p.c. Con. ...	135—145	...	...
540,000	,,	,,	6½	6½	Do. 5 p.c. Con. ...	120—130	...	127
195,500	,,	,,	6	6	Do. 6 p.c. B Pref.	125—135	+5	...
1,287,500	,,	Feb. 29	5	5	Bristol 5 p.c. max.	107—108[a]	+½	...
120,420	,,	June 20	4	4	Do. 1st 4 p.c. Deb. ...	85—90[a]	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	85—90[a]	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	115—120[a]	+5	...
855,000	,,	Apl. 4	7	8	British Ord.	125—135	...	128—135
100,000	,,	June 20	7	7	Do. 7 p.c. Pref.	120—130	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	87—92	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	105—115	...	...
160,000	,,	July 4	5	5	Cambridge 5 p.c. Deb. ...	105—115*	...	...
100,000	10	May 23	6	6	Cape Town, Ltd.	7½—8½	...	...
100,000	10	Apl. 29	4½	4½	Do. 4½ p.c. Pref. ...	6—7	...	...
150,000	Stk.	June 20	4½	4½	Do. 4½ p.c. Deb. ...	80—90	...	87—87½
626,860	,,	Feb. 15	6	6	Cardiff Con. Ord.	100—105	...	...
237,860	,,	July 4	2⅜	5	Do. 5 p.c. Red. Deb.	105—110*	...	...
157,150	,,	Feb. 15	5	6½	Chester 5 p.c. Ord.	89—94[b]	+2	...
98,936	1	May 23	2/-	2/-	Colombo, Ltd. Ord.... ...	26/—31/-	...	...
24,500	1	,,	1/4⅛	1/4⅛	Do. 7 p.c. Pref.	17/—19/-	...	...
609,204	1	Apl. 4	-/10'90	-/11'47	Colonial Gas Assn. Ltd. Ord.	10/—15/-	...	...
296,058	1	,,	1/2'54	1/3'30	Do. 8 p.c. Pref.	10/—15/-	...	...
2,073,280	Stk.	Feb. 15	6	5⅔	Commercial Ord.	100—110	...	107½
475,000	,,	June 20	3	3	Do. 3 p.c. Deb. ...	70—75	...	...
807,560	,,	Feb. 15	7	7	Croydon sliding scale ...	132—142	...	133—138
469,590	,,	,,	5	5	Do. max. div.	90—100	...	...
500,000	,,	July 4	5	5	Do. 5 p.c. Deb.	110—120*	+2½	...
542,270	,,	Feb. 29	7	10	Derby Con.	117—122[c]	...	...
55,000	,,	July 4	4	4	Do. 4 p.c. Deb.	65—70[c]*	...	...
209,000	,,	Mar. 14	5	5	East Hull Ord. 5 p.c. ...	90—100	...	95—97½
179,500	,,	Feb. 29	5⅔	5⅔	East Surrey Ord. 5 p.c. ...	105—115	...	...
155,019	,,	June 20	5	5	Do. 5 p.c. Deb. ...	110—115	...	...
1,002,180	,,	Mar. 14	14	16½	European, Ltd.	95—105	+5	97—97½
19,405,992	,,	Feb. 15	5⅔	5⅔	Gas Light & Coke 4 p.c. Ord.	22/6—24/6[f]	+·/6	22/6—24/3
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	78—83	+3	79—82
4,477,106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	95—100	+7½	93½—100
6,102,497	,,	June 20	3	3	Do. 3 p.c. Con. Deb. ...	73—78	...	76½—79
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	109—114	...	...
2,500,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	105—110	+2	105—109
264,011	,,	—	—	—	Harrogate New Cons. ...	105—110	+5	109—110
82,500	,,	Mar. 14	7	7	Hastings & St. L. 5 p.c. Conv.	110—115	...	...
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	90—95	...	...
70,000	10	June 6	15	110	Hongkong & China, Ltd. ...	10—11	...	...
213,200	Stk.	Feb. 29	6	6	Hornsey Con. 3½ p.c. ...	105—110	...	...
5,600,000	,,	June 6	15	14	Imperial Continental Cap.	180—200	...	186—197
223,180	,,	Feb. 1	3½	3½	Do. 3½ p.c. Red. Deb.	77—82	...	...
235,242	,,	Mar. 14	8½	8½	Lea Bridge 5 p.c. Ord. ...	145—155	...	...
2,145,907	,,	Feb. 29	6	6	Liverpool 5 p.c. Ord. ...	110½—112½[b]	+5½	...
245,500	,,	June 20	5	5	Do. 5 p.c. Red. Pref. ...	100—110[b]	+7½	...
306,083	,,	Jan. 15	4	4	Do. 4 p.c. Deb. ...	87—92[b]	+2	...
165,786	,,	Feb. 15	8	10	Maidstone 5 p.c. Cap. ...	155—165	+27½	...
56,176	,,	June 20	3	3	Do. 3 p.c. Deb. ...	65—70	...	...
75,000	5	June 20	110	110	Malta & Mediterranean ...	7½—8½	...	8
					Metropolitan (of Melbourne)			
892,000	—	Apl. 1	5½	5½	5½ p.c. Red. Deb.	95—100	+15	96—97
171,978	Stk.	Feb. 29	5	5	M. S. D. Utility "C." Cons.	88—93	+12	...
718,657	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	82—87	+5	...
112,126	,,	July 4	4	4	Do. 4 p.c. Deb. ...	87—92*	+5	...
148,955	,,	,,	5	5	Do. 5 p.c. Deb. ...	105—110*	...	...
675,000	,,	21 May '31	16	16	Montevideo, Ltd.	40—60	...	...
2,061,316	,,	Feb. 29	5	5⅔	Newcastle & Gateshead Con.	21/—22/-[d/]	...	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	89—91[d]	+5	...
691,705	,,	June 20	3½	3½	Do. 3½ p.c. Deb. ...	84—86[d]	+5	...
277,285	,,	Apl. 29	5	5	Do. 5 p.c. Deb. '43...	105—110[d]	...	...
274,000	,,	Feb. 15	5	5	Newport (Mon.) 5 p.c. max.	84—86[a]	...	...
199,940	,,	Mar. 14	7½	7½	North Middlesex 6 p.c. Con.	135—145	+5	...
396,160	,,	Feb. 15	5	5	Northampton 5 p.c. max. ...	90—100	...	...
300,000	,,	Apl. 18	9	7	Oriental, Ltd.	85—95	...	94½
205,162	,,	June 20	8	8	Plym'th & Stonehouse 5 p.c.	140—150	+5	143—145
504,416	,,	Feb. 15	8	8	Portsm'th Con. Stk. 4 p.c. Std.	140—150	+5	139
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	90—95	...	...
114,000	,,	Feb. 15	5	5	Preston 5 p.c. Pref.	102—107	...	...
686,312	,,	Jan. 18	4	4	Primitiva 4 p.c. Rd. Db. 1911	77—82	...	...
389,813	,,	June 20	4	4	Do. 4 p.c. Cons. Deb.	76—81	...	...
150,000	10	Apl. 4	6	6	San Paulo 6 p.c. Pref. ...	7—7½	...	...
1,736,968	Stk.	Apl. 4	6	6	Sheffield Cons.	108—112[e]	+6	...
95,000	,,	Jan. 18	4	4	Do. 4 p.c. Deb.	92—96[e]	+10½	...
133,201	,,	Feb. 29	8½	5	Shrewsbury 5 p.c. Ord. ...	110—115	...	...
90,000	10	June 6	15	15	South African	4—6	...	...
6,709,895	Stk.	Feb. 15	5	7	South Met. Ord.	117—122	+4	116—122
1,185,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	125—135	+3	127—130
1,895,445	,,	July 4	3	3	Do. 3 p.c. Deb. ...	74—79*	+1	76½—78
1,000,000	,,	Jan. 18	4	5	Do. 5 p.c. Red. Deb.	108—113	+1	110½
91,500	,,	Feb. 29	8½	8½	South Shields Con.	129—131[d]	...	...
1,543,795	,,	Feb. 15	6½	6	South Suburban Ord. 5 p.c.	112—122	+2	115½—120
300,000	,,	,,	5	5	Do. 5 p.c. Pref.	109—114	+1	112½—113½
668,337	,,	June 20	5	5	Do. 5 p.c. Deb.	116—121	+9	117—120½
647,740	,,	Feb. 29	5	5	Southampt'n Ord. 5 p.c. max.	90—95	...	...
121,275	,,	June 20	4	4	Do. 4 p.c. Deb.	90—95	...	...
250,000	,,	Feb. 29	7	7	Swansea 7 p.c. Red. Pref. ...	...	...	...
200,000	,,	June 20	6½	6½	Do. 6½ p.c. Red. Deb.	103—108	...	...
1,076,490	,,	Feb. 29	6½	6½	Tottenham and District Ord.	122—132	...	124—130
300,000	,,	,,	5⅔	5⅔	Do. 5½ p.c. Pref. ...	113—118	...	...
199,005	,,	June 20	4	4	Do. 4 p.c. Deb. ...	90—95	...	...
85,701	,,	Apl. 4	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	70—75	...	...
					Uxbridge, Maidenhead, &			
346,069	,,	Feb. 29	7	7	Wycombe 5 p.c.	120—130	...	...
88,380	,,	,,	5	5	Do. 5 p.c. Pref. ...	100—105	...	108
1,822,220	,,	July 4	7	7	Wandsworth Consolidated	130—140*	...	134—139
971,373	,,	,,	5	5	Do. 5 p.c. Pref.	108—113*	...	110—113½
1,167,964	,,	June 20	5	5	Do. 5 p.c. Deb.	110—120*	...	116—119½
158,400	,,	Feb. 29	5	6g	Winchester W.& G.5p.c.Con.	90—95	...	...

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of stock. *g* Paid £3, including 10s. on account of back dividends. * Ex. div. † Paid free of income-tax. ‡ For year.

(This announcement is inserted gratuitously.)

PETER—WITH ONE EXCEPTION

With one exception Peter is an ordinary little fellow. Chubby, likeable, just five-and-a-half, full of life and fun and on occasions—be it admitted—of naughtiness.

Just now Peter's rather important, for this is his first term at school, and he's grappling with the intricacies of "A B C" and "Twice Two": difficult subjects to all men of five-and-a-half, but even more difficult in Peter's case because—bad luck—he's totally blind. That's his One Exception.

Peter learns reading, writing, and 'rithmetic through the medium of "Braille"—dull stuff compared with the coloured picture books of most five-and-a-halfs. However, he's a stout lad is Peter, and he's making great progress.

Would you like to know more about him? How, in spite of his "One Exception," he is being educated, and, when older, technically trained and usefully employed.

There is a long waiting list of "Peters" throughout the British Isles, for whom training and accommodation must be provided in the immediate future.

Will you help with a donation or annual subscription? Any sum, large or small, will be gratefully received.

Here's a suggestion. Your eyesight is worth 3d. a year to you. Send Peter and his handicapped pals 3d. for every year you've had it. Now, please, in case it slips your memory. Good idea!

THE CHAIRMAN,

SCHOOL FOR THE BLIND

(Founded 1838),

Swiss Cottage, LONDON, N.W.3

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see earlier page.]

The wonderful response to the War Loan Conversion Scheme and the result of the Lausanne Conference maintained a very firm tone in all markets last week. The chief feature was the strength of British Funds, the demand for which continued unabated, and some large buying orders were placed for 5 p.ct. War Loan non-assented (*cum* cash bonus), the price closing on Saturday at 101½ and 100½ for the *ex* cash bonus variety. Many prices in other sections showed substantial improvements, though these have been brought about mainly by a demand created by sellers of War Loan in their endeavour to re-invest more advantageously from the point of view of yield.

The change in investment values is having a marked effect on the prices of Gas Stocks and Shares, and further substantial improvements were made last week. As is well known, the value of these stocks as a rule varies little from year to year, but the following tables, giving the prices ruling on April 22 compared with Saturday's closing prices, show the extent of the advances made by some of the leading stocks in a few weeks:

Ordinary and Preference Stocks.

—	Quotations.		Rise.
	April 22.	July 16.	
Bristol 5 p.ct.	96—98*	107—108*	10½
British	110—115	125—135	17½
Commercial	95—98	100—110	8½
Croydon sliding-scale	108—111	132—142	27½
Gas Light £1 units	20/—21/-	22/6—24/6	3/-
,, 4 p.ct. preference	80—84	95—100	15½
Newcastle £1 units	18/—19/-†	21/—22/-†	3/-
,, 4 p.ct. preference	75—76	89—91	14½
Portsmouth	124—129	140—150	18½
South Metropolitan	102—105	117—122	16
,, ,, 5 p.ct. preference	113—118	125—135	14½
South Suburban	102—107	112—122	12½
,, ,, 5 p.ct. preference	96—101	109—114	13
Southampton	75—80	90—95	15
Tottenham	104—108	122—132	21
Wandsworth	115—120	130—140	17½

Irredeemable Debenture Stocks.

Bristol 5 p.ct.	97—98*	115—120*	20
Commercial 3 p.ct.	59—62	70—75	11
Croydon 5 p.ct.	99—102	110—120	14½
Gas Light 3 p.ct.	64—67	73—78	10
Newcastle 3½ p.ct.	67—68†	84—86†	17½
South Metropolitan 3 p.ct.	63—66	74—79	12
South Suburban 5 p.ct.	99—104	116—121	17
Tottenham 4 p.ct.	77—82	90—95	13
Wandsworth 5 p.ct.	100—103	110—120	13½

* At Bristol. † At Newcastle.

The largest increase last week was Maidstone ordinary, which gained no less than 27½ points to 160, yielding on a 9 p.ct. basis £5 12s. 6d., which is still high compared with many other ordinary issues in the List. The Metropolitan (of Melbourne) 5½ p.ct. debentures came next with a gain of 15 points to 97½, while the Mid-Southern District Utility "C" rose 12 points to 90½.

There was a particularly heavy demand for Gas Light, South Metropolitan, and South Suburban issues, and at one time Gas Light 4 p.ct. preference changed hands at par and South Suburban 5 p.ct. debenture at 120½.

A further addition has been made to the Stock and Share List by the inclusion of £274,000 Newport (Mon.) 5 p.ct. maximum consolidated stock. This stock is not subject to sliding-scale, and the maximum dividend thereon has been paid since 1921. Quotations are available at Bristol, Cardiff, and Newport, and that of the first-named Exchange inserted in the List. Last week's price of 84-86 shows a considerable improvement compared with a few weeks ago, though it is still rather undervalued.

Trade Notes.

Tully Plant for Anstruther Company.

The Anstruther and Cellardyke Gas Company, Ltd., have placed an order with Messrs. Tully, Sons, & Co., Ltd., for a second mechanically-operated coal gasification plant. The original "Tully" plant was installed in 1921.

Current Sales of Gas Products.

The London Market for Tar Products.

LONDON, *July* 18.

There is no change to report in the prices of tar products, which remain the same as last week, viz.:

Pitch, 95s. per ton f.o.b.

Creosote, 3¼d. to 5d. per gallon f.o.b., according to specification.

Refined tar is 4d. to 4¼d. per gallon in bulk at makers' works.

Pure toluole is about 2s. 6d.; pure benzole, about 1s. 8d.; 95/160 solvent naphtha, 1s. 4½d. to 1s. 5d.; and pyridine bases, 3s. 9d. to 4s.—all per gallon naked at makers' works.

Tar and Tar Products in the Provinces.

July 18.

The average prices of gas-works products during the week were: Gas-works tar, 34s. 6d. to 39s. 6d. Pitch—East Coast, 85s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 85s. f.o.b.* Toluole, naked, North, 1s. 9d. to 1s. 10d. Coal-tar crude naphtha, in bulk, North, 5d. to 5¼d. Solvent naphtha, naked, North, 1s. 2½d. to 1s. 3d. Heavy naphtha, North, 10½d. to 11d. Creosote, *ex* works, in bulk, North, liquid and salty, 2½d. to 3d.; low gravity, 1¼d., Scotland, 2½d. to 3d. Heavy oils, in bulk, North, 4¾d. to 5¼d. Carbolic acid, 60's, 1s. 7d. to 1s. 8d. Naphthalene, £9 to £10. Salts, 55s. to 75s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *July* 15.

Distillers are maintaining quotations at current level, but new business is scarce and competition is keen for any orders on the market.

Crude gas-works tar.—Actual value is 57s. 6d. to 62s. 6d. per ton *ex* works.

Pitch.—Export value remains nominal at 85s. to 90s. per ton f.o.b. Glasgow, while home orders continue to command 90s. to 95s. per ton *ex* works in bulk.

Refined tar to Ministry of Transport Specification is quiet with to-day's value round 4¼d. to 4½d. per gallon f.o.r. naked.

Creosote oil.—Supplies are scarce, and prices are steady. B.E.S.A. Specification is 3¼d. to 3¾d. per gallon; low gravity, 3¾d. to 4d. per gallon; and neutral oil, 3¾d. to 4d. per gallon—all f.o.r. in bulk.

Cresylic acid is only in small request. Pale, 97/99 p.ct., is 1s. 0½d. to 1s. 1½d. per gallon; dark, 97/99 p.ct., 11½d. to 1s. 0½d. per gallon; and pale, 99/100 p.ct., 1s. 2½d. to 1s. 3½d. per gallon—all f.o.r.

Crude naphtha.—Value is unchanged at 4½d. to 5d. per gallon, according to quality.

Solvent naphtha is dull and uninteresting at 1s. 2d. to 1s. 3d. per gallon for 90/160 grade, and 11d. to 1s. per gallon for 90/190 grade.

Motor benzole.—Production is low, but price remains easy at 1s. 2½d. to 1s. 3½d. per gallon in bulk quantities *ex* works.

Pyridines.—90/160 grade is 3s. to 3s. 3d. per gallon, and 90/140 grade 3s. 3d. to 3s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole	0	7	to	0	7½	per gallon at works
Motor ,,	1	2	,,	1	3	,, ,, ,,
Pure ,,	1	6	,,	1	7	,, ,, ,,

Contracts Advertised To-Day.

Coal.

The Gas Committee of the Borough of Burton-on-Trent invite tenders for coal. [Advert. on p. 163.]

Compressing Plant.

The Skipton Gas Department invite tenders for compressing plant in connection with their high-pressure gasholder scheme. [Advert. on p. 163.]